

THE IRON AGE

New York, Thursday, March 3, 1910.

COMPRESSED AIR AND ITS USES.—I.

Power Transmission and Vertical Excavation.

Solids have considerable molecular cohesion, liquids very much less and gases none at all; their molecules tend to separate and the application of heat increases this separating activity. Each gas has a certain tension for any given temperature. By compression tension is increased, following the law that action and reaction are equal, and the tension, or resistance, of a gas is exerted equally in all directions.

Air is a gaseous mixture, mostly nitrogen and oxygen, and behaves as other gases at all ordinary temperatures. It resists compression with an equal tension, its tension increases when heated, and, in common with all matter, it occupies space to the exclusion of all

hydraulic compressor of this general type was said to have an efficiency of 70 per cent., the 158 hp. of the fall storing 111 hp. in compressed air.

In applying steam to compress air in a cylinder by forcing in a piston it becomes the problem to unify the progressive compression in the air cylinder with the progressive rarefaction in the steam cylinder; ordinarily with steam used expansively in a direct acting pump the steam piston would be most powerful when the air piston had least resistance, and *vice versa*. In one design the two cylinders were placed at right angles and the two connecting rods were pivoted to two cranks at an angle of 30 degrees apart. This

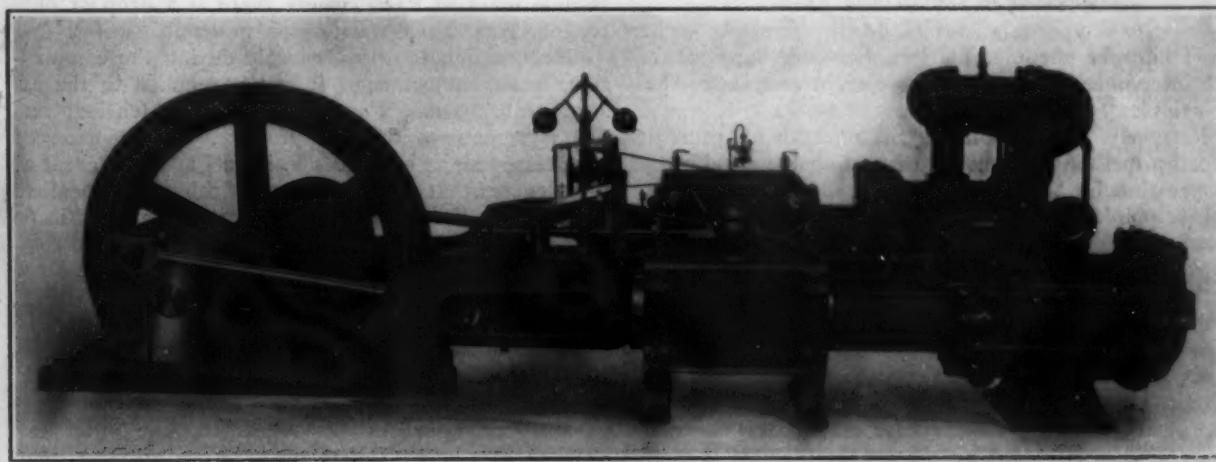


Fig. 1.—A Laidlaw-Dunn-Gordon Two-Stage Duplex Air Compressor.

other matter, *i. e.*, it is impenetrable so far as its actual substance goes.

To these properties is due the industrial value of compressed air.

Types of Compressors.

The blacksmith's bellows is perhaps the oldest type of air compressor known. The method of compression employed with the old Catalan forges is an improvement as it utilizes the natural fall and weight of water to trap and compress air, and there have been a number of recent applications of analogous methods. As typical of these, suppose a considerable stream of water falling a moderate height to be connected above and below the fall by an underground pipe or inverted siphon. The velocity of flow through the siphon will depend upon the hydraulic head or difference in level of the two bodies of water; but the maximum pressure will be determined by the vertical length of the shorter arm. If air be trapped and carried to the bottom of the siphon it will there be compressed to a tension equal to the pressure of the surrounding water. A method of collecting the air under pressure is, in effect, to increase the cross section of the siphon bottom and thus decrease the velocity of the flow permitting the entrained air to separate out because of its lighter specific gravity, and from such a pocket it may be drawn as required. The trapping of the water may be accomplished by a sucking-in process in which no doubt the head is the controlling factor. One installation of a

arrangement probably partially solved the problem, and such compressors were recently said to be still in use for compressing ammonia. Another design placed the cylinders at an angle of 45 degrees and joined the two connecting rods to a single crank, which arrangement likewise met the difficulty in part. Another modification placed the cylinders at an angle of 135 degrees, but otherwise followed the last method. Apparently none of these designs fully harmonized the two pressures, and they proved unsteady in operation. In such machines certain parts had to be very heavy and strong, which was expensive. In lieu of the angular arrangement the straight line compressor uses a fly-wheel to store the surplus energy of the steam piston at the beginning of the stroke and deliver it at the end. In another arrangement, instead of operating a single air cylinder by a single steam cylinder, two of each kind are worked together, each set connected as in the straight line arrangement, and the two coupled together by connecting rods to two cranks placed at right angles to each other. Thus when either set is on the weak half of its stroke, the other is on the strong half of its stroke and they assist one another.

The compression of air is attended with the evolution of heat, which introduces another mechanical difficulty when any considerable pressure is required. Air compressed to 200 lb. from atmospheric conditions at 60 degrees F. will have a temperature between 600

and 700 degrees F., and even much lower temperatures than this are troublesome. One remedy is to employ water jackets, but these are inadequate for extreme conditions, which gave rise to compressing by stages (sometimes as many as four) with cooling between, by passing the air through intercoolers. Often to cool the finally compressed air an after cooler is used, which dries the air by precipitating the contained moisture, making it better suited to its work, preventing freezing if the air is piped where it is exposed to cold temperatures.

In Fig. 1 is an example of the duplex arrangement, and represents a type of compressor furnished by the Laidlaw-Dunn-Gordon Company for use on the Panama Canal. The two connecting rods are seen arranged a quarter revolution apart and with the fly-

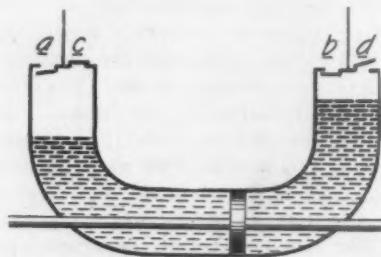


Fig. 2.—Diagram Showing a Method of Cooling Air During Compression by Contact with Water.

wheel between them. This is a two-stage apparatus. The intercooler is at the extreme right and above the air cylinders.

Formerly in the United States and at present abroad a method is employed of cooling the air during compression by actual contact with water. The general principle may be understood from Fig. 2. A piston reciprocates in a horizontal cylinder, having a vertical extension at each end, and a mass of water partly fills the whole. As the piston moves back and forth the water level rises ahead of it and falls behind it, compressing the contained air alternately at the two ends. On one stroke the inlet valve *b* closes and the valve *d*, communicating with the compressed air reservoir, opens, while the valve *c*, also communicating with the reservoir, is closed by the pressure above it, and the inlet valve *a* opens as soon as the air below it falls to atmospheric pressure. Upon the return of the piston this air drawn into the chamber is compressed, the valve *a* closing promptly, and *c* opening when the pressure below becomes equal or a little greater than that in the reservoir. Much of the heat of compression is absorbed by the water, which is constantly changed and its action reinforced by a spray. A second type of direct water cooling is accomplished by the use of sprays alone, which makes a large surface of water

available at once. This is done by introducing water jets through the cylinder heads of the air chambers to play upon the on-coming piston and be broken up into spray. All water in excess of that filling the clearance space at the end of the stroke is driven into the reservoir along with the compressed air, from which it may readily be drained off.

The machines in most favor in this country to-day are those cooling the compressed air by intercoolers, aftercoolers and water jackets. Such are known as dry compressors. In them a small quantity of air is left in the compression chamber at the end of the stroke, which, upon return of the piston, expands again to atmospheric pressure before any fresh air is admitted. Being warm, the amount of new air it excludes is aggravated, hence the desirability of very small clearance space. In the best designs this space is between 0.2 and 1.0 per cent. of the total cylinder volume.

Compressed Air for Power Transmission.

Compressed air is probably second only to electricity as an economic means of transmitting power considerable distances. There are two sources of loss—its fall of temperature in transit with corresponding loss of tension, and friction, which is believed to be partially offset by heating the air and restoring some of the lost tension. That compressed air may be transmitted long distances with moderate loss is shown in a 10-mile main in Paris, where there is a drop of only 16.4 lb. from an initial tension of 92 lb.

Heat, which is so undesirable during the compression, is advantageous, if it can be applied to the air after transmission, for it increases the tension, and this is sometimes done in practice. The tension of compressed air at 0 degrees F. is half again as great at 240 degrees. It is entirely practicable to reheat to 300 degrees F., and if the temperature initially is 60

degrees the increase in tension amounts to —, 240
520.6

degrees being the increase in temperature and 520.6 degrees the absolute initial temperature of 60 degrees above zero (absolute zero is 460.6 degrees F.).

The conversion of mechanical energy into the energy of tension is only accomplished, like other exchanges, at a loss. The object to be gained is twofold, transmission and distribution, and conversion into a form more suitable for the purposes in hand. Compressed air is an admirable means by which power may be transmitted long or short distances and then distributed to small machines, whether fixed or portable. It is also a wonderful means for the exclusion of water in engineering operations involving a contest with water. With machines a moderately high temperature may be used, but in pneumatic engineering the temperature must be kept at or near nor-



Fig. 3.—Open Caisson Construction.—The Chicago & Northwestern Railroad Bridge Across the Mississippi River at Clinton, Iowa.

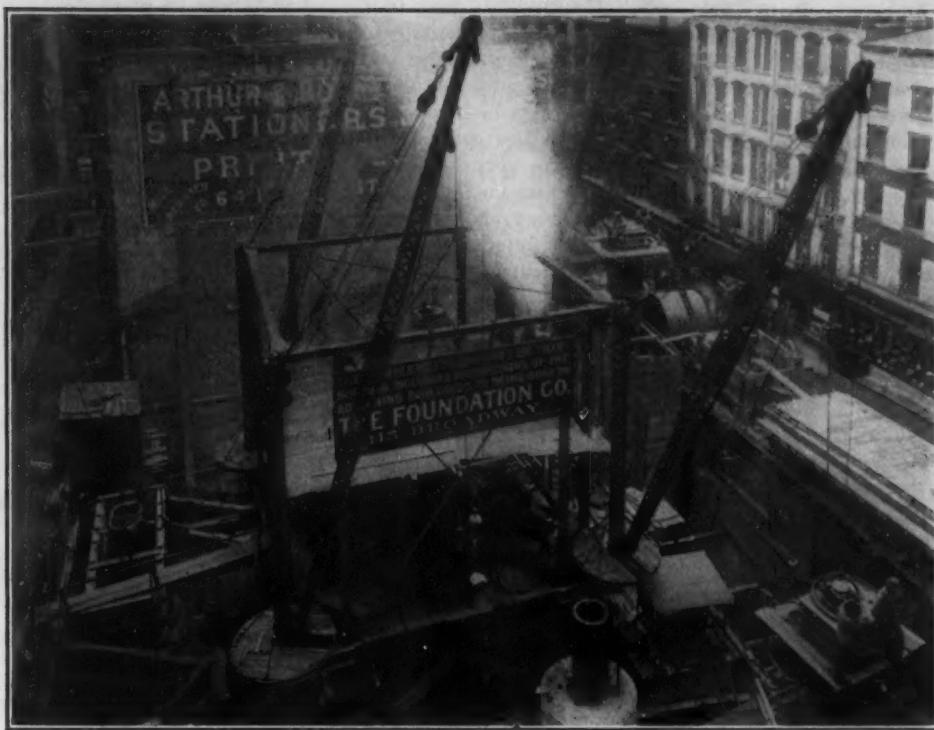


Fig. 4.—Sinking Piers for a Building in New York City.

mal because workmen breathe it and labor in it. The reheater, then, has no place in this latter application, but the compressing and cooling apparatus have. It is important that the compressors be reliable, for a failure in the supply may mean death to workmen or at least suspension of operations.

Compressed Air in Vertical Excavation.

Excavation in solid, impervious rock may be expensive and slow, but the penetration is very sure; but where the strata are soft or water bearing, new complications enter. The actual digging and removing the soil can frequently be done with orange peel grab buckets or other excavators apart from the presence of workmen at the point of excavation, and the surrounding soil may be prevented from caving in by using the open caisson. If the object is securing a footing for piers and the like, the digging may be stopped upon reaching solid rock, or if piles are to be used, they may be driven when the caisson has reached an advantageous depth. Concreting may be done through the water and the whole structure be brought up above the surface without necessitating the presence of workmen within the caisson, subsequent to penetration below the water level, if at all. In Fig. 3 is an example of open caisson construction. The piers shown were constructed by sinking steel caissons formed of plates to a suitable depth by excavating from the inside. Piles were then driven and the interior filled and capped. The illustration shows a bridge

across the Mississippi River at Clinton, Iowa, constructed, in so far as foundation work went, by the Foundation Company of New York and Chicago for the Chicago and Northwestern Railroad.

It is often necessary or advisable, however, to have workmen on the spot and to lay concrete in the dry. In securing footings for such structures as the piers of the Brooklyn Bridge or the foundation columns of the Singer Building tower, it is well to know absolutely that the very soundest stratum has been reached and that the masonry or concrete has been laid under the best conditions. Then it is necessary to go

and see the character of the rock and to have it dry for the masonry. Moreover, conditions may render the continued presence of workmen almost necessary. Such considerations have brought about a great development in pneumatic excavation. Compressed air is employed in the caisson, not to perform the digging operations but to exclude water. The possibility of doing this arises from the impenetrability of air and its ability to maintain a pressure against that of water. The general principle of the pneumatic caisson is to exclude water from entrance into a bottomless working chamber by compressed air, always at a tension equal to or slightly in excess of the hydrostatic pressure of the water at that level. The tension of free air at the earth's surface is equal to the weight upon it and averages at sea level 14.7 lb. per square inch. Below the water level 1 ft. a resistance per square inch in excess of this would have to be supplied equal to the weight of a

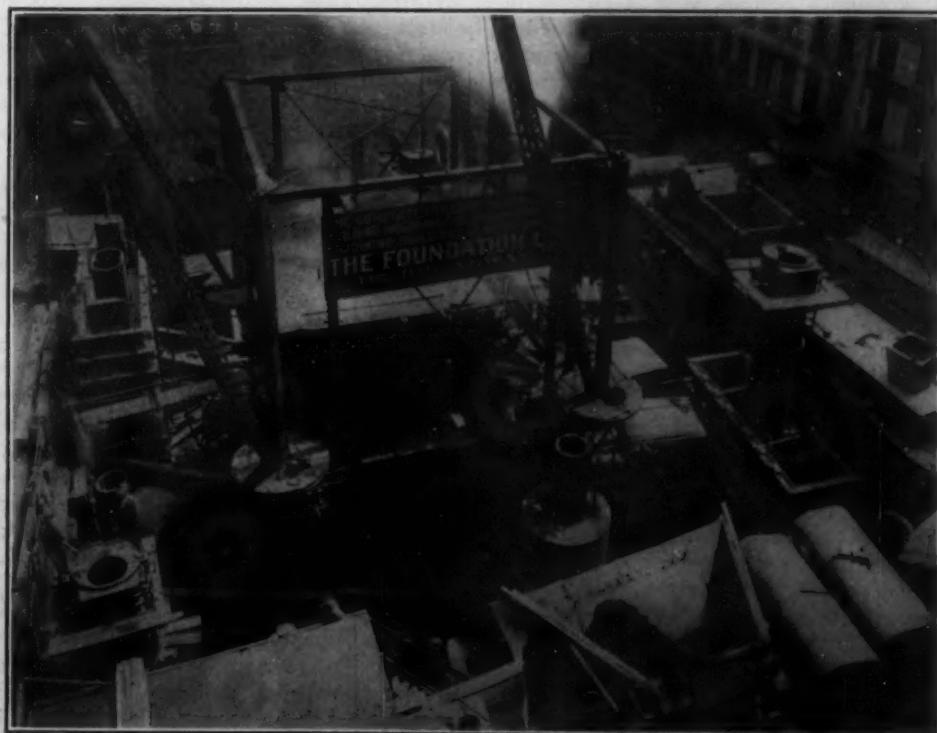


Fig. 5.—A View of the Same Work a Little Farther Along.

column of water 1 ft. high and 1 sq. in. in cross section. As water weighs about 62 1-3 lb. per cubic foot, this excess tension will have to be 0.433 lb. per square inch. This, then, is the compression that will have to be effected. The tension required is 14.7 lb. more, as not only the water has to be supported but the weight of the atmosphere on the water. In compressing air, however, this one atmosphere is had to start with, so that the gauge of the compressor which shows the actual compression discloses precisely the excess. The second foot of penetration below the water level will add another 0.433 lb. of compression required, and so on. To go 50 ft. below, the air compression would have to be 21.65 lb. per square inch, something less than 1½ atmospheres. A single atmosphere is added by going to a depth of 33.94 ft. ($14.7 \div 0.433$). Three atmospheres are about the limit of human endurance, so that the depth of 100 ft. is about as far down as it is practicable to go below the water level by pneumatic means. If a thoroughly impervious stratum is penetrated by the pneumatic caisson the excavation may sometimes be continued further by non-pneumatic methods, leaving the caisson behind; or, if the material in the stratum is not sufficiently impervious, the caisson may, at times, be left behind and the air pressure maintained. In the former case penetration below the three-atmosphere limit could be accomplished. As an example of the continuance of the air pressure subsequent to abandonment of the caisson, may be cited certain work done in sinking the foundation piers for the tower of the Singer Building. Quicksand had to be penetrated and for this the pneumatic caisson was employed. Between the lowest level of the quicksand and bed rock was a thick stratum of hard pan. After going into this stratum for, say, a foot or so, the caisson was left suspended, as it were, and the excavation continued on to bed rock. The air pressure was still maintained because of the permeability of the hard pan. It was sufficiently solid, however, to require no lateral support, which accounts for the possibility of leaving the caisson. Bed rock, at the corner of Liberty street and Broadway, New York, where the Singer Building is located, is about 90 ft. below the curb and about 75 ft. below the water level. The air pressure at the finish was consequently required to be somewhat in excess of 32 or 33 lb. per square inch.

Types of Caissons.

The typical caisson is a very strong rectangular box without a bottom, with a cutting edge of steel around the lower edge. The sides need to be strong, since they may be exposed to the pressure of water as penetration is continued. This pressure becomes enormous and averages over the lateral surfaces only a little less in intensity than that of the air, when, as often happens, the air pressure within is reduced momentarily and suddenly. Further, the roof of the caisson is to be loaded with a great weight of concrete or other masonry, and while the air pressure normally assists, still the sides must be sufficiently strong to carry a heavy weight and suddenly applied. The same applies to the roof itself. The roof is perforated at one or more points by a shaft to afford communication between the interior of the caisson and the external air. Surrounding the shaft, masonry or concrete is laid. The side walls of the caisson are continued on up to inclose this material. When the caisson has reached its final level, there will thus be a shell of the same cross section as the caisson and extending from the roof to the surface or a point above the water level. Within will be a second shell, the shaft. The portion of the pier lying between the two and above the caisson roof will be constructed in whole or in part. The space within the shaft and the working chamber are empty of solid material and have still to be filled. If the footing reached is such that the air pressure may be discontinued, this may be done and the space properly filled. If the air pressure must still be maintained,

the concrete may be placed in whole or in part under pressure. The office of the external shell or cofferdam is to exclude the surrounding soil and to provide a smooth surface, and thus reduce surface friction. It may also be a mold for concrete.

In any particular case modifications may be made. At the very beginning of operations the caisson may have its cutting edge at or close to the surface, with the roof above that surface. The cofferdam may be constructed with a height of a few feet and concrete added at once. It is not at all unusual to employ but a couple of sections of cofferdam. The lower one may be entirely removed while the upper one is still acting as a mold for fresh concrete. In this way it is often possible so to manage that there is never any portion

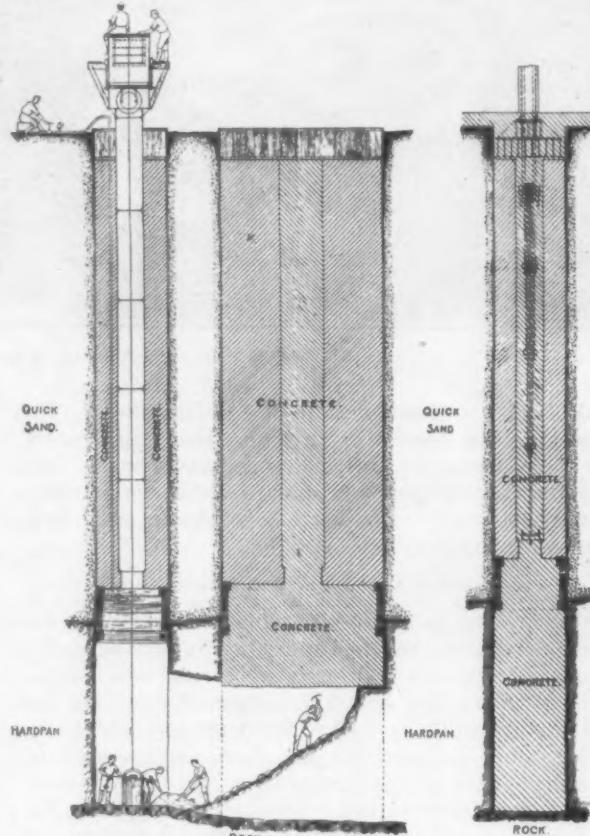


Fig. 6.—Vertical Sections Showing an Interesting Piece of Work in Connection with the Singer Tower Foundation.

of the cofferdam below the surface. The hardened and smooth concrete is well suited to withstand lateral pressure from water and soil and to set up but a moderate skin friction. In Fig. 4 is shown a view of operations in sinking piers for a New York City foundation. Back of the derrick on the right and seen in part between its boom and post is a rectangular cofferdam only a few feet in height. Below it may be observed the concrete of the pier, also of rectangular form, which has been previously laid and the cofferdam form removed. Concrete will be poured into the cofferdam now in place. In Fig. 5, a later view of the same site, another cofferdam, also empty, is seen a little to the front of the former one. This view shows in the foreground, and also projecting upward from the cofferdam, portions of two shafts connecting undoubtedly with different working chambers. The upper end of the shaft in the one case is terminated by the air lock. In the other case no air lock has yet been attached. The pier itself is cylindrical and its concrete is in plain view with the cofferdam removed. Up and down such shafts the workmen pass. The bucket which descends empty and returns laden with spoil uses the same passageway. The shafting here shown is of steel, is collapsible, and may be removed and used again. It cannot be removed, however, until it is no longer desired to maintain the air pressure, for it affords the means

of attaching the air lock. Not only must it be hermetically connected with the shaft wall, but it must be securely enough attached to withstand the great upward thrust of the compressed air. With a compression of one atmosphere, every square inch of the cross section of the air lock is thrust upward with a pressure of 14.7 lb. If it is 3 ft. in diameter at the point of attachment, then the upward pressure is about $7\frac{1}{2}$ tons. To balance this there is only its own weight and whatever it may contain. The shafting may be added in sections as the caisson sinks and the concrete is put on. At the close of operations the shaft lining must be removed not later than when the concreting of the working chamber is completed. The air pressure is then turned off.

The entire cross section of the caisson, including the air lock, receives the upward thrust of the compressed air. A circular caisson 9 ft. in diameter would have an upward thrust of 67 tons. This becomes a source of real difficulty, for what is desired is a downward pressure on the cutting edge so as to force it down into the excavation as it is made. The weight of caisson, concrete and all the accessory structures would supply it, but it is opposed by the compressed air and also by the skin friction. In practice it is often necessary to supplement the weight by adding considerable quantities of pig iron. In such a job as that of the new municipal building, New York City, the capital thus tied up in the iron may run up to \$25,000. Sometimes the excavation has been carried some little distance below the cutting edge, and upward and downward pressure and skin friction are so evenly balanced that some considerable additional pressure downward is needed. This is sometimes secured, in effect, by lowering the air pressure for a moment. Thus in the case of a circular caisson of 9 ft. diameter, a reduction of 1 lb. per square inch would be equivalent to the addition of $\frac{1}{2}$ ton of pig iron.

The sinking of a pneumatic caisson off shore in an exposed situation occasions special difficulties. An interesting case occurred in the construction of the Sabine Light Station, 15 miles off shore in the Gulf of Mexico, near the Louisiana and Texas line. The depth of water varies from 16 to 18 ft. Borings made showed that the bottom was practically nothing but sand to a depth of over 20 ft. The cutting edge was sunk to 39 ft. below the water level, consequently requiring an air pressure of about 17 lb. per square inch. The conical cylindrical caisson itself was partially erected 16 miles away and consisted of working chamber, cofferdam and air shaft. It was built largely of cast iron plates. The shaft was of steel. At the site a temporary working platform was erected to envelop three-fourths of the caisson. Examination of the weather records shows that the entire sinking operation would better be done within about 40 days beginning June 10. The erection of the caisson was begun in April and when three courses of plates had been secured in place it was launched. Previous to launching a wooden temporary bottom had been constructed. Subsequent to flotation this was knocked off. The number of courses of cast iron plates was increased to five and over 200 tons of concrete laid on the deck above the working chamber. To provide for giving the structure more weight quickly a wooden partition, polygonal in cross section, was constructed within the cofferdam portion and enveloping the air shaft, so that a considerable volume of water might be introduced between partition and shaft. Between cofferdam and partition concrete could also be added. The water compartment permitted a prompt sinking of the caisson to the bottom when once moored over the site. That excessive oscillation might be avoided before the caisson should come to rest on the bottom the annular water space was divided into sub-compartments. When the complex structure reached its destination a sea was running, but it was decided to proceed with the operation

of sinking. The inlet valves were opened, the water rushed in, and in an hour and a half the caisson was resting on the bottom. Because of its movement occasioned by the sea and of the character of the bottom, the caisson came to rest with a penetration into the sand equal to the height of the working chamber. Around the exterior of the caisson 200 tons of rock was placed. The air lock was attached, air turned on and actual excavation begun, and in about a month this was completed and the caisson had reached the desired level. The diameter of the cutting edge was about 35 ft. For a height of about 13 ft. the caisson tapered in slightly and the remainder was cylindrical.

The Air Lock.

The object of an air lock is similar to that of a canal lock. The latter permits passage between differing levels; the former passage between atmospheres of differing tensions. The working chamber of a pneumatic caisson and any connecting passages must be absolutely closed, otherwise the compressed air will promptly escape and possible disaster result. But it is imperative to get in and out. As may be seen in Fig. 6, the air lock is a chamber with a down opening door in the floor and one in the roof. Suppose the upper door to be closed and the cock connecting the lock chamber with the outside air shut. If a connection between the shaft and the lock chamber be opened the tensions above and below the lower door will be equalized, permitting that door to be opened. Passage into or out of the lock chamber may then be made. The lower door may be closed and the cock shut off which controls the connection between shaft and lock, and by opening the connection between the lock and the outside atmosphere entrance into or departure from the air lock may be made. Since whenever the lock chamber is connected with the outside air it is shut off from the shaft and whenever cut off from the outside air it is connected with the shaft, it is possible to manage these operations by a single three-way cock.

New York Conditions.

While the pneumatic caisson is frequently used in bridge construction, its use in the construction of the foundations for skyscrapers has been a development comparatively recent, because the very tall building itself was only recently in demand and geographically limited, because ordinarily conditions can be more economically met by other methods on the southern part of Manhattan, especially in the financial and office district, conditions and demand are such that compressed air seems almost the only means available. From about the Wanamaker store northward bed rock is just below the curb or even above it, but southward the stratum of solid rock dips below the street level until a depth of 183 ft. is reached at Broadway and Duane street. It rises again and approaches the street surface in the vicinity of the Battery. Nearly the whole is beneath the level of mean high water. As there are great deposits of sand overlying the rock in this same district, a solid foundation is frequently to be reached only by passing through quicksand. At times the depth of the subaqueous penetration is considerable. As before noted, there was about 75 ft. of such work at the Singer Building. At the site of the building of the Trust Company of America, on Wall street, near Broad, the layer of quicksand varied, so it is said, from 15 to 45 ft., and this was underlaid by a stratum of hardpan 3 to 5 ft. thick.*

Laying bare bed rock without damage to nearby buildings and doing it all within a confined area means that other things besides mere cost of the work itself must be considered. If the adjoining buildings have been erected, not on the rock but upon spread footings underlaid by quicksand, nothing may be done that will withdraw any of this underlying material. Otherwise

* A detailed account of the foundation operations in connection with this building were given in *The Iron Age* February 14, 1907.

sheet piling might be driven around the site and the interior of the cofferdam thus constructed excavated and pumped out; but if the piling is not sufficiently tight, sand might be pumped away from the exterior and provoke settlement of the adjacent structures. It is probable, however, that practically impervious piling could be driven. Geo. W. Jackson constructed a cofferdam in 30 ft. of water with steel sheet piling. The piling must be braced, however, to withstand the lateral thrust occasioned by the hydraulic head plus the effective weight of the superimposed soil and building. It seems possible that this could be accomplished. But whether the expense might not fully equal the pneumatic method is another question. At any rate, the pneumatic caisson is almost exclusively used in New York City where the conditions are such as those described.

It was intended originally to sink the piers for the Singer tower only to compact hardpan, which overlies the rock to a considerable height. One of the pier caissons had been so built when it was determined to carry the remaining piers to the bed rock itself; then, that the first pier might be no exception, the contractor, the Foundation Company, undertook to complete this one, not by letting it down until its foot rested upon the rock, but by going beneath it and filling in the intervening distance with concrete. In Fig. 6 is a vertical section through three of the piers, the one in the center being the short pier in question. To the right is a finished pier. The caisson minus its deck is left hanging at a point where it had just begun to enter hard pan. The collapsible steel shafting has been removed, tie rods introduced and the whole concreted up from bed rock to the top. On the left is an unfinished pier. The air lock and steel shafting are still attached and the air is still on. The air is supplied not to the lock or shafting directly, but to the caisson or working chamber. The excavation has been continued to bed rock. Instead of concreting up the base of the pier, the excavation is continued off to the side to get below the short pier. This pier was of very great weight. The skin friction was no doubt very considerable, but it was not deemed advisable to rely on this to support it, so in undermining the work was done in sections, leaving at all times a support of hard pan, hard concrete or both. The entire excavation was always under air pressure.

Mine Shaft Sinking.

It is sometimes possible to employ both open and pneumatic methods in sinking caissons. If the material first encountered is non-water bearing, the caisson may be sunk partially or entirely through it without compressed air. If the underlying material is under considerable upward pressure, the floor of the excavation may be rent open when the overlying support has been considerably reduced. This upward thrust is usually occasioned by the presence of water or quicksand under the pressure of some superior hydrostatic head or of some weight of material, but if nothing of this kind is to be feared, open excavation can proceed until the water itself is encountered. Thus expense may sometimes be reduced. At other times, in ordinary engineering operations, the open method may be employed throughout, especially if the water level is reducible by pumping. Frequently in Germany, and occasionally here, in sinking mining shafts to the ore ledge a considerable flow of water is encountered. The steel sheet piling formed of channel bars held face to face and interlocked with I-beams was invented to care for a water-bearing stratum in sinking a shaft at the Good Hope mines in Germany. At first the attempt was made to sink a cylindrical shell of masonry. Before the water bearing stratum was quite penetrated and the underlying clay reached, the shell stuck, having gotten out of plumb. Metal piling of the kind described was successfully employed, a satisfactory joint being made with the masonry.

Sometime since the Cleveland-Cliffs Iron Mining Company proposed to sink a shaft to the underlying rock ledge. Water was known to underlie the surface, but in what quantity was uncertain. A number of perforated tubes were put down and some connected up with pumps. The pumps were started and the level of the water watched in an unconnected observation pipe. It was found that control of the water by pumps could not be relied on. The Foundation Company being engaged to sink the shaft proceeded to do it by pneumatic methods. The shaft was to have an internal section of about 11 x 15 ft., and to be of reinforced concrete. A cutting edge was first constructed of heavy timbers, with a steel shoe. Upon this a wall of reinforced concrete 3 ft. thick and of the required internal cross section was built. At the height of about 6 ft. a circumferential notch was arranged on the inside for securing the roof of the working chamber to the concrete shell. A steel shaft 4 ft. in diameter was secured to the roof and provided with a Moran air lock. With the concrete shell about 18 ft. high operations were begun without the use of compressed air, but as the water level was but 5 ft. down it was not long until it was brought into service. The concrete was continually kept 18 ft., or thereabouts, above the surface, and thus required the use of three sections of forms. Considerable space was left upon the inside of the concrete shell between it and the shaft. Eventually the whole interior was to be free, so that no additional concrete could be laid to provide a sinking weight. However, none was required until a depth of 35 ft. below the water level was reached. The upward thrust of the air was now about 430 tons. It is probable that penetration thus far had been materially assisted by the 18 ft. of concrete shell above the surface of the ground. Wet sand was now put on to give additional weight. When at last the ledge was reached it was found to be not at all horizontal. The surface was leveled and sinking continued for a couple of feet further. This penetration into the rock was for the purpose of passing a seam and making a secure interlock. The blasting was performed under air pressure. A part of the timbering of the cutting edge was removed, leaving projecting bolts. When the bottom of the concrete shell was now joined to the rock by a stratum of concrete, these served to bind the two masses of concrete together. A similar bond was made with the rock by steel dowels. After this concrete had been put in the air pressure was kept on for several days to prevent its injury by the pressure of the external water.

(To be continued.)

Railroad Equipment Orders.—The Chesapeake & Ohio is receiving bids on 1500 cars. The Chicago Great Western is reported in the market for 200 steel underframe box cars and the Mexico Northwestern for 260 freight cars. The Hill lines are reported in the *Railway Age Gazette* to have ordered 4000 freight cars from the Haskell & Barker Car Company—3500 box and 500 automobile cars. Of the former, the Burlington road will get 1500. The Rock Island has ordered 825 steel underframe box cars from the Western Steel Car & Mfg. Company, and is still in the market for 775 cars. The Richmond, Fredericksburg & Potomac is reported to be inquiring for 20 locomotives, and the Colorado & Southern for 15, in addition to 7 for the Fort Worth & Denver City. The Hocking Valley has ordered 10 locomotives, and the New York, Ontario & Western 6, from the American Locomotive Company.

Commenting on the weekly trade reviews of the commercial agencies, a financial writer on an important daily says they have "found nothing absolutely bad to report." This is quite reassuring.

The Woods No. 20 Planer and Matcher.

The rapid production and high degree of finish demanded by the modern car shop and planing mill has resulted in the very rapid development of the planing machine. Perfect cutterhead work and rapid feed have made necessary some radical changes in design which are well exemplified in the machine shown in the illustrations, built by the S. A. Woods Machine Company, Boston, Mass. Figs. 1 and 2 show the front and rear of the machine and give a general idea of its appearance. Notable features are the use of one belt, which drives both cutterheads, a design made possible by a new type of flexible coupling, illustrated in Fig. 3, and the location of the belt on the back of the machine which tends toward much greater security against accident to the operator. The workman is required to true the cutterheads while they are running at full speed, and it will easily be seen that the removal of the belts from the front of the machine is a safeguard of no small importance.

One of the obstacles to securing high class cutterhead work is the difficulty of maintaining the journals in perfect condition. The pull of their belts under the cutting strain may be as high as 1500 lb., and the speed 3200 ft. per minute. Under these conditions, with the increased size of belt required for fast feed, the accuracy of the adjustment of the cutterhead is soon lost by

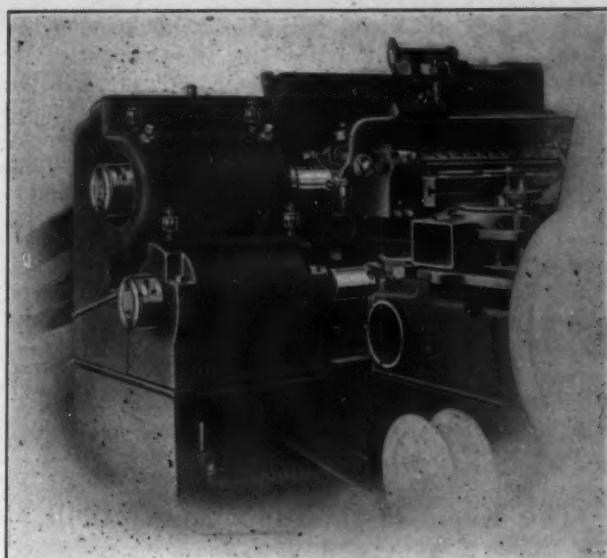


Fig. 3.—Detail Showing the Flexible Couplings Connecting the Pulley Shafts to the Cutterheads.

shaft is another weakness which is considered to be serious and difficult to eliminate. It has not been unusual for the belt lacing to leave a mark on the stock each time that it went over the pulley. The difficulty

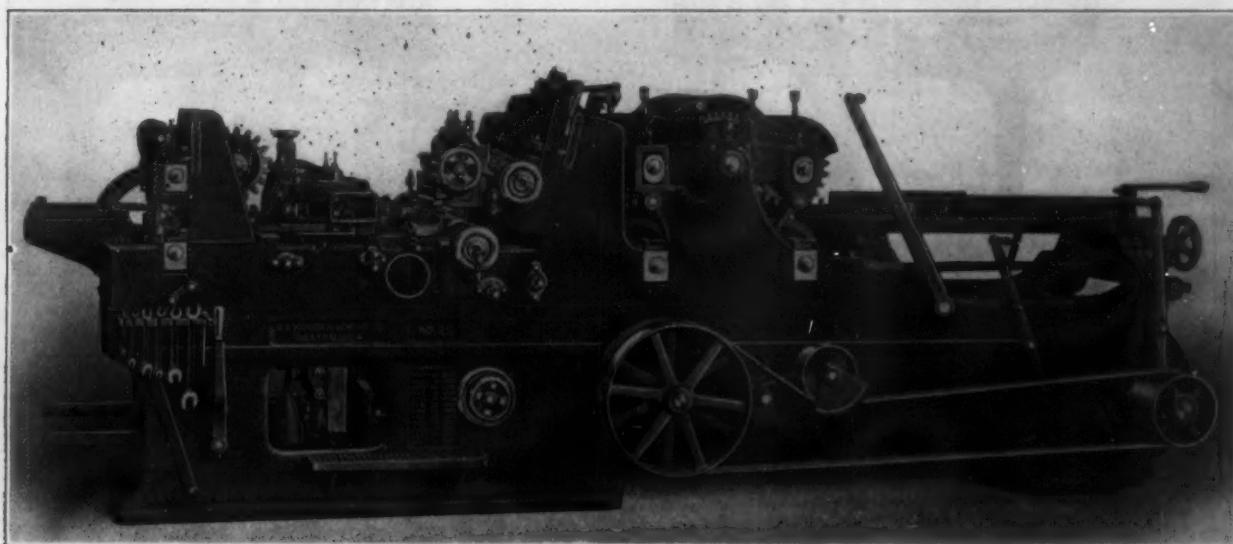


Fig. 1.—The New Rapid Production Wood Planer Built by the S. A. Woods Machine Company, Boston, Mass.

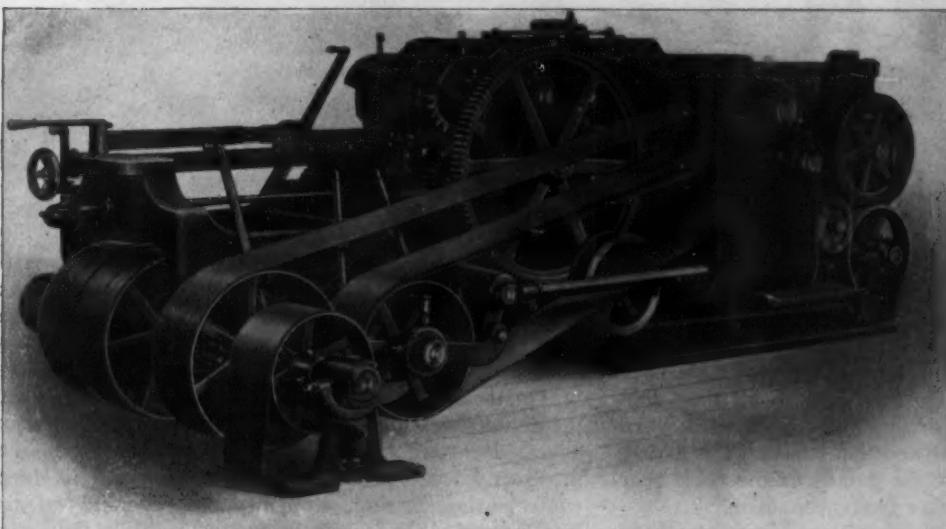


Fig. 2.—View of the Opposite Side of the Planer, Showing the Single-Belt Drive.

the wear on the journals, as adequate lubrication of long boxes is difficult and uncertain. The vibrations and jars of the cutterhead caused by the belts on the

of making two belts run exactly alike has also added to the troubles of the designer under the former standard practice. The importance of the factor of belt slip in the problem will be appreciated when it is realized that a difference of 0.01 in. in the diameter of the cutterhead pulleys means a difference from 10 to 12 ft. in the amount of belt travel at the ordinary planing mill speed, the difference being exaggerated by variations in thickness and tension of belts.

In this new machine the designers have sought to overcome all these objectionable features by employing

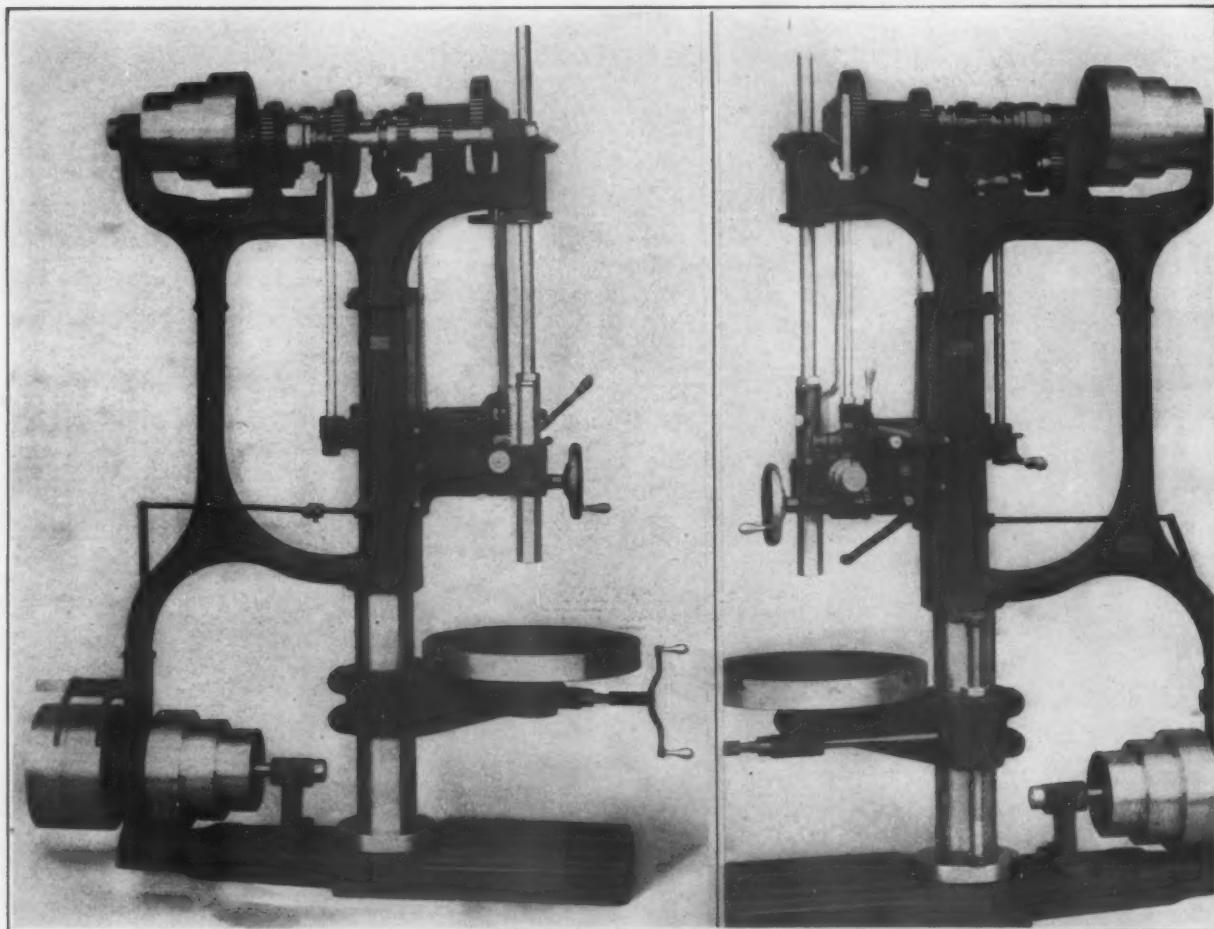
a single belt which passes over the driving pulley of each cutterhead shaft. Each pulley is supported by boxes entirely independent of the cutterhead itself, the connection being made by a flexible coupling. The designers believe that this coupling absorbs effectually all the vibrations transmitted to the pulley by the belting, which relieves the cutterhead journals from the strain of the belts and other disturbing elements. The use of very short journals upon the cutterheads is also permitted, thus simplifying the problem of lubrication, which is accomplished by improved oiling devices. The design also makes possible the instant detaching of the cutterhead from the spindle, leaving it free to be turned when setting up without disturbing the belts. High speed steel cutters are used on this machine, which assist in the production of finished surfaces, upon which little or no trace of tool marks can be found.

The Kern 25-In. High Speed Drill.

A combined drilling and tapping machine designed to use high speed steel tools has been perfected and

obtained through the back gears. Advantages, as compared with the usual four-step cone pulley type drill with single back gear, are one more speed and greater driving power, for the three-step cone pulley can take a wider belt and it also has larger diameter steps. The cone diameters are 9, 11 and 13 in., respectively, and a 3½-in. double belt driven at 440 rev. per min. is used. With the four-step cone drive usually employed, the diameters vary from about 5 to 11 in. and a 2½-in. single pulley belt, seldom running faster than 350 rev. per min. is used. Hence the claim that this drill has about twice the power of the ordinary type for high speeds and three times for slow ones.

The powerful double back gears are located on the top housing between the spindle and the frictions used for starting, stopping and reversing it. Sliding gears and a positive clutch provide for the necessary changes in the back gears, and by a conveniently located lever on the top housing these changes may be effected without stopping the machine. The highest gear ratio is 12.5 to 1, and the frictions of the controlling clutch have the benefit of this high ratio. In severe drilling



Two Views of the 25-In. High Speed Drill Built by the Kern Machine Tool Company, Cincinnati, Ohio.

recently placed on the market by the Kern Machine Tool Company, 4657 Spring Grove avenue, Cincinnati, Ohio. This drill is known as the 25-in. high speed upright drill, and is equipped with a three-step cone pulley and double back gears. All the features that have been found, from experience, to be essential to the rapid production of accurately drilled and tapped work have been retained and several new ones have been added. Principally of interest are the details of the back gear arrangement and the positive feed mechanism.

Nine changes of spindle speed are provided; three are direct or open belt speeds, and these are tripled by the double back gears. The belts run at high speed and afford ample power for high speed drilling, while for slow speed drilling and heavy tapping this high initial power is increased by the great speed reduction

and tapping operations, they are, therefore, required to pull less than one-twelfth of the actual power exerted at the spindle, and at all times have a comparatively light duty to perform, which obviates likelihood of slipping and insures long life to the clutches.

On the top housing between the driving cones and the double back gears is located the tapping attachment operated through spur gears and clutches by a lever projecting from the side of the column. This lever controls the starting, stopping and reversing of the spindle, and when it is in its neutral position the entire machine, with the exception of the cone pulleys, is brought to a standstill. This not only eliminates unnecessary wear, but also furnishes a convenient means for making the changes in the back gears without any shock to the drill. On machines where no tapping at-

tachment is provided this clutch and the lever are still furnished for controlling the starting and stopping of the drill.

The positive geared feed which provides eight different rates, advancing in approximately geometrical progression from 0.006 to 0.050 in. per revolution of the spindle, is mounted on the sliding head. The construction is very simple, and only seven gears and two levers are used. The correct position of the levers for any desired feed is indicated by a feed plate fixed to the drill.

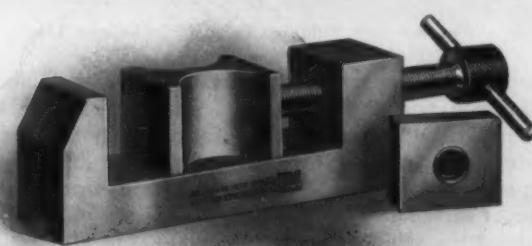
The principal dimensions and specifications of the drill are given in the following table:

Height of drill, inches.....	80%
Diameter of column, inches.....	6 1/2
Diameter of spindle, inches.....	1 9/16
Diameter of spindle in sleeve, inches.....	11 1/16
Greatest distance from spindle to table, inches.....	32
Travel of spindle, inches.....	10
Morse taper of spindle.....	No. 4
Diameter of sleeve, inches.....	2 1/2
Diameter of driving pulleys, inches.....	14
Face of driving pulleys, inches.....	4 1/4
Diameter of table, inches.....	23 1/2
Speed of countershaft, revolutions per minute.....	445
Vertical adjustment of table, inches.....	15
Net weight, pounds.....	1,900

All the gears employed are of steel, and have wide faces and coarse pitch. An automatic stop and depth gauge are provided which operate by graduations on the spindle sleeve and permit the spindle to trip at any desired point within the limits of its travel, thus allowing any number of holes to be drilled to a fixed depth. In designing this machine care has been taken to locate all the controlling devices at convenient points. It will be noticed from the illustrations that all the levers are placed on the right side of the drill, and may be manipulated by the operator without any change of position.

The New Brown & Sharpe Toolmakers' Vise

The toolmakers' vise shown in the illustration is the latest addition to the line of tools made by the Brown & Sharpe Mfg. Company, Providence, R. I. It is of steel, drop forged and case hardened, and, while light and convenient to handle, is strong enough to stand any severe usage to which it may be subjected. It is particularly useful in connection with



A New Vise for Toolmakers, Made by the Brown & Sharpe Mfg. Company, Providence, R. I.

drilling, fitting and laying out work on surface plates, as well as for general use in machine shops. Two jaws, giving a maximum capacity of 2 in., slip on and off the end of the screw and can be used interchangeably. The screw is turned by a short sliding bar fastened through a knurled nut at the end, the nut affording a firm grip for the operator when tightening the jaws. The screw is hardened to resist wear. An accurate V-block placed in the base of the vise adds much to the value of the tool, permitting its use for centering round bars and for other purposes requiring a block of this character. It is used by simply turning the vise upside down.

The Baird Wire Forming, Ferruling and Stamping Machine.

A new machine of the Baird Machine Company, Oakville, Conn., is shown in Fig. 1. It is designed to combine in one the wire forming and stamping machine and the wire forming and ferruling machine, which were illustrated and described in *The Iron Age*

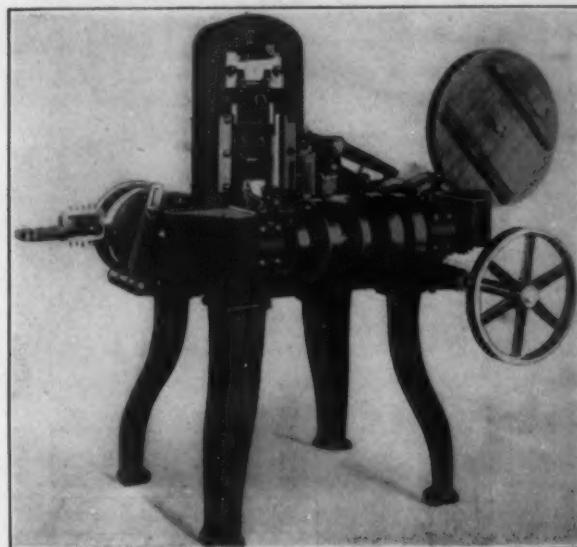


Fig. 1.—A Combination Machine Built by the Baird Machine Company, Oakville, Conn., for Forming, Stamping and Ferruling Small Wire Articles.

January 6 and February 3, 1910, respectively. Like these it is automatic in operation and will take the wire from the coil, straighten, feed, cut off, form and stamp it into small articles, and take sheet metal from a reel carried on the vertical board shown at the right of the machine, cut off, form and attach a ferrule made from it around the wire form and then carry it to a press and flatten or stamp it, as shown in Fig. 2.

Originally this machine, like the other two mentioned, was a special one made for hose supporter loop

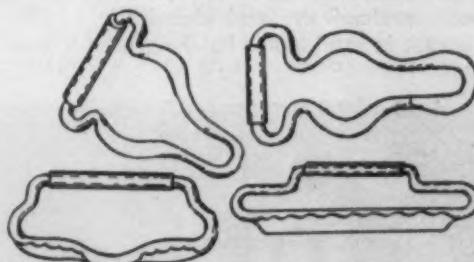


Fig. 2.—Typical Products of the Machine.

manufacturers, but many other different lines have been found for it, so that it is now built as a standard machine. The completed articles are turned out at the rate of approximately 60 to 80 per min., according to size and shape, and no attention is necessary from the operator beyond keeping the machine supplied with wire and metal strips, and removing the finished product from time to time. Several sizes of the machine are built to cover a large range of work.

The price of silver has fallen sharply on the announcement of an advance in the duty imposed by India. The new duty is to be 4 annas per Troy ounce. The value of an anna is about 3 cents.

The Treasury Department has extended the benefit of the drawback to finished safe doors, exported as a part of safes or separately, manufactured by the Ely-Norris Safe Company of Perth Amboy, N. J., with the use of imported steel castings.

Segregation Phenomena in Steel Castings.*

Results of Recent Metallographic Investigations in a Comparatively Unworked Field.

BY S. S. KNIGHT.

Some 14 years ago the subject of segregation phenomena in cast iron was quite thoroughly investigated by the writer. The results which he published at that time were somewhat unsatisfactory, owing to the fact that in cast iron the amount of free carbon present is a factor which not only greatly hampers observation

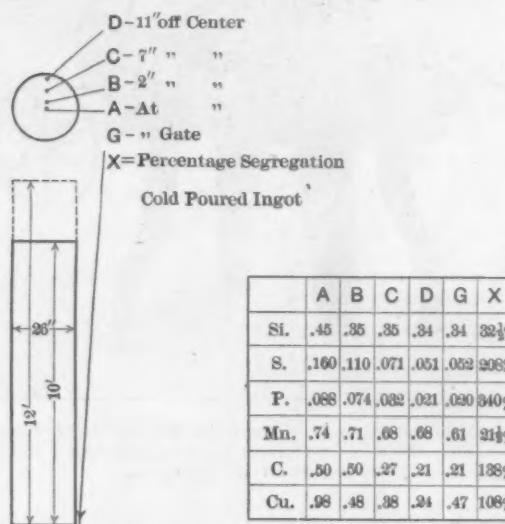


Fig. 1.—Segregation in Cold Poured Casting.

mechanically, but is of no small importance in affecting the results themselves. In steel which has undergone work the observation of segregation phenomena could not possibly give as satisfactory results as in ingots or castings which have had no work done upon them, because the soaking, rolling or hammering all tend more or less to counteract the effect of segregation, both mechanically and chemically. The steel which is cast in sand molds has long been looked upon

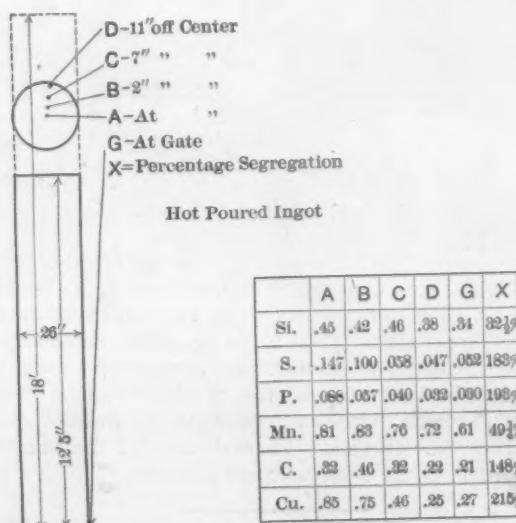


Fig. 2.—Segregation in Hot Poured Casting.

as more or less of an uncertainty for the purpose for which it is intended, unless very large factors of safety are allowed, because it is almost impossible to get castings which are homogeneous. This lack of homogeneity comes about primarily from the occlusion of certain gases or foreign substances, such as dirt or

* A paper read at the meeting of the Philadelphia Foundrymen's Association, March 2, 1910.

slag, in the material itself while in a semimolten or plastic condition, as well as from segregation.

"Killing" Basic Steel for Castings.

The "killing" of steel, as it is popularly termed, is unquestionably one of the hardest things to accomplish satisfactorily in the steel foundry. If basic practice is being used the fact that you have covering the molten metal in the ladle a slag which is hungry for all acid forming elements, means that it is beyond human possibility, as far as is now known, to keep your steel during pouring of the same chemical composition. The writer has seen many basic heats, running from 50 to 100 tons, poured from a single ladle, where the silicon content varied 400 to 500 per cent. in samples taken from the first and the last of the pouring, and yet the total amount of time consumed in the operation was less than half an hour. In some casting plants the metal is tapped into a receiving

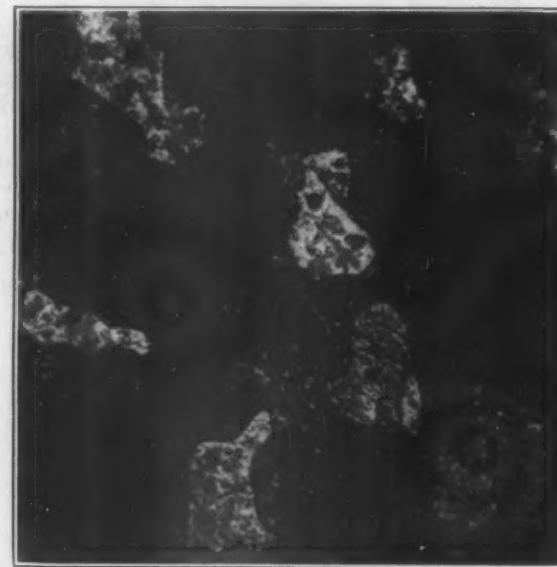


Fig. 3.—Iron Sulphide Crystals in Refined Iron.

ladle mounted upon trunnions, and the basic slag skimmed and thus largely disposed of before being poured into the crane ladle from which it is teemed into the molds. This partly obviates the difficulties encountered from the basic slag, but tends to cool off the metal in the ladle. The Talbot process or any of its analogues, which does all of the refining in the basic furnace and then allows the molten steel to be transferred to the acid furnace, to be there held so that the majority of the gases may escape from the bath before having the additions made, is probably the best approach to perfect practice which the open hearth industry will be able to develop, as applicable to large quantities of metal. Even this, while not as expensive as the after treatment in an electric furnace, as is now being done in some four or five plants in the United States, is still too costly for the ordinary purchaser of steel castings. The reducing atmosphere of the electric furnace, as well as the tremendous agitation of the bath caused by the passing of current through it, in all of the resistance types, necessarily tends to produce a steel of great purity if the additions are properly made.

Ladle Additions in Acid Practice.

In the acid practice the absolute inability to lower the sulphur and phosphorus content necessitates the

use of high grade material for which, of course, manufacturers have to pay a premium. On the other hand, acid steel, if properly made, should leave the furnace hearth almost free from absorbed gases, and before the pouring commences should be thoroughly killed and capable of producing castings free from blowholes which would arise from the composition of the steel itself. Of course, the matter of blowholes arising from improper sand mixtures or of dirt holes coming from improper closing or dirty molds, simply must be rectified by attention to detail in the molding shop. Probably a great deal of the trouble producers of steel castings have who use the acid process is due to the fact that the additions made in the furnace or ladle are not of the right composition, or are not properly made, and such expedients as aluminum shot for use in the heads and gates are of very little value. There should be no call for their use, since when the necessity for them arises it simply means that the practice in some previous operation has been lamentably bad.

Advantages and Drawbacks of the Converter.

Now in Bessemer practice the steel is poured at a much higher temperature, and as a result piping is aggravated and shrink holes and check cracks are more likely to occur. The additions, however, are very much more apt to be taken up by the mass of



Fig. 4.—Phosphide of Iron (Fe_3P_8) in Steel.

metal and thoroughly disseminated through it, owing to the fact that the temperature of the bath is higher and that the material has been in such a state of tremendous agitation. The heavy losses experienced, however, by the ordinary manufacturer making castings by the Bessemer process are such that the majority of the people who attempt to do this commercially are usually disappointed in the results which they get in a financial way. The low cost of installation and the facility with which this method adapts itself to intermittent production make it seem very desirable to the uninitiated; but as a general thing experience seems to be telling producers of steel castings that Bessemer plants are operated to the best advantage when they are maintained as auxiliaries to large open hearth establishments, where work of the most desirable character for this process can be furnished them.

Crucible Steel Castings.

In the crucible steel industry the possibility of steel being properly killed is probably less than in any of the processes above described, owing to the fact that in the United States the production of crucible steel castings is to-day very largely in the hands of people who have recently gone into the business. Unfortunately,

the best result with this process, when graphite or black lead crucibles are used, cannot be as good as that of the acid, Bessemer or open hearth processes described, owing to the fact that if the steel is held in the crucibles after the additions are made a sufficient length

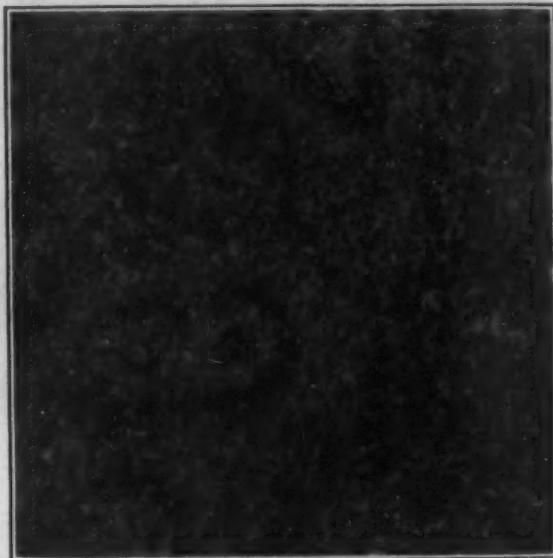


Fig. 5.—Phosphide of Iron (FeP) in Steel.

of time for the bath to be properly killed, the life of the crucible is so reduced that production becomes very expensive. Probably of all the steel cast in America to-day crucible steel, as it is made and sold in the shape of castings upon the open market, is by far the least homogeneous. Now leaving out of consideration all causes of the lack of homogeneity other than segregation we find that five elements are most vitally concerned in this phenomenon: Sulphur, phosphorus, manganese, carbon and copper, and all are subject to great segregation in bodies of steel when cooling.

Segregation with Low Temperature Pouring.

Fig. 1 shows a casting weighing approximately 22,000 lb., and serves well to illustrate several points not heretofore very clearly explained as far as we



Fig. 6.—Phosphide of Iron (FeP) from Meteorite.

know. This casting was drilled at the gate G, where the metal practically set as soon as the pouring operation was completed, and where no chance for segregation occurred; it was also drilled at the points A, B, C and D, these places being located at the center, and 2, 7 and 11 in. off center respectively. The transverse

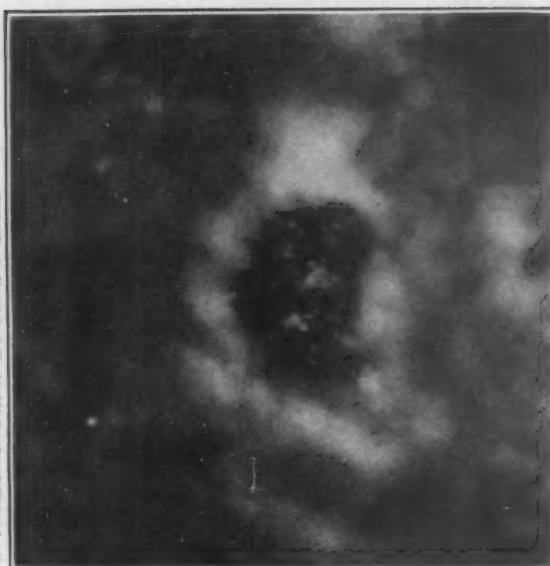


Fig. 7.—Manganese Sulphide in Cemented Steel.

plane from which these drillings were taken was at the extreme upper part of the solid portion of this casting, the piping taking up all of the part beyond this and the head. Other than this piping there was no evidence of lack of mechanical homogeneity in this material. The casting was poured on end and in the ladle was added all of the steel plate, amounting to about 12 per cent. of the total weight of the bath, which the molten metal would take up, this plate being added at the time the metal was tapped from the furnace. In making these castings no effort was made in any way to retard or diminish the shrinkage of the steel or the segregation of the elements mentioned. The piped portion of this ingot amounted to 17 $\frac{3}{4}$ per cent. of its total weight.

Segregation with High Temperature Pouring.

Fig. 2 represents another casting made in the same way, but which was poured just as hot as it was possible to get the material in an acid furnace. You will note that the piping extends in the case of the cold poured ingot in Fig. 1 through just 16 $\frac{3}{4}$ per cent. of its total length; in the hot poured ingot extends through 30 $\frac{1}{2}$ per cent. of its total length. The piped portion of the latter ingot was 27 $\frac{1}{2}$ per cent. of its total weight. Inasmuch as both of these were cast in absolutely dry molds this seems to show conclusively that the colder the metal can be poured into any casting the less piping and shrinkage there will be when the metal sets. Now, by looking at the analyses of the drillings which came from this hot poured ingot, the location of each sample corresponding to that indicated above for the cold poured ingot, you will notice at once that the hotter the material is at the time the casting is poured the less the tendency to segregation. For instance, in these two ingots the tendency to segregate was identically the same as far as the silicon was concerned, or 32 $\frac{1}{2}$ per cent. In the cold poured ingot the segregation in sulphur amounted to over 208 per cent., in phosphorus to 340 per cent., in manganese to 21 $\frac{1}{2}$ per cent., in carbon to 138 per cent. and in copper to 108 per cent. In the hot poured ingot the segregation in sulphur amounted to 183 per cent., in phosphorus to 193 per cent., in manganese to 49 $\frac{1}{4}$ per cent., in carbon to 148 per cent. and in copper to 215 per cent. By comparing these figures it seems reasonably certain that as far as the silicon and carbon are concerned the segregation is not much affected by the temperature at which the metal is poured. The sulphur and phosphorus would seem to segregate much more in metal which is poured cold than in metal poured at a higher temperature, while the tendency to segregation in manganese is directly the opposite. In copper, however, it would

seem that the metal poured hot shows a far greater segregation than the metal poured cold.

Deductions from Castings 1 and 2.

These figures, in the light of what has been published within the last few years upon the phenomena of segregation, would seem to show that many of our popular theories are decidedly at variance with the facts. In the first place, the slow and gradual cooling which is supposed to prevent segregation does so with only certain elements; at least, this is the deduction which would necessarily follow from the figures given above. In the next place the keeping of a perfect heat condition in the fluid or semifluid metal would probably tend to eliminate a large proportion of the segregated impurities, provided the temperature of the upper part could be so regulated that the extreme upper surface was the last to cool or set; in other words, that the cooling would take place, starting at the bottom and slowly rising to the top and in a regular manner. How this is to be accomplished we certainly cannot form any idea. It would seem in any ordinary casting that probably the greatest cause for segregation would be the throwing of the impurities toward the center as the material sets. In the ordinary casting the probability is that in a very large percentage of cases the whole casting sets at almost the same time, and consequently the material is fairly homogeneous from a mechanical standpoint. Of course, large die blocks, forging ingots and pieces of such nature would be exceptions to this rule. It would be very interesting to study the segregation of a large sand cast ingot, providing it were split longitudinally right through the center, a series of drillings being carefully made and analyses accurately determined.

By looking at the analyses of the drillings taken from the several points it will be noticed that sulphur, phosphorus and copper show the greatest tendency toward segregation. In the case of sulphur the writer is almost positive that all of this element which occurs in steel is in the form of iron sulphide of the chemical composition FeS. In cast iron he believes that a portion of the sulphur is in the form of FeS₂, and this is true with all forms of iron in which the amount of graphite or free carbon exists to any appreciable extent. This assumption is based upon the fact that in order to get the maximum amount of sulphur by the evolution method out of pig iron or cast iron it is necessary to roast the sample, as was described by the writer in some of the iron trade journals in 1903. Now this roasting is of no avail in the ordinary carbon steels, as far as the writer knows, and he has never been able to get higher results by the use of this method on that class of material.

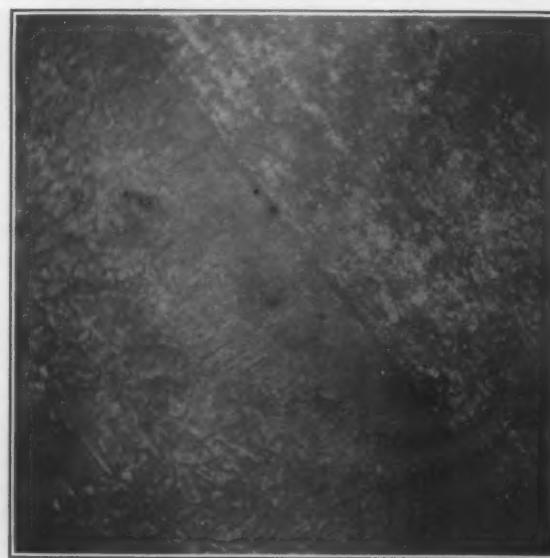


Fig. 8.—Alloy Film in Copper Clad Steel Rod (86 Diameters).

Sulphur Segregation.

The photomicrograph in Fig. 3 shows a very mild refined iron having the following composition:

Per cent.	Per cent.
Silicon	0.0188
Sulphur	0.203
Phosphorus	0.020
Manganese	None.
Carbon	0.02
Copper	None.

This specimen was etched in nitric acid and the crystals of iron sulphide show very plainly, although the magnification is only 86 diameters. In cast iron the writer was never able to isolate the sulphides metallurgically. It is further his belief that in all steels the sulphur tends to segregate, and these segregations are one of the most fruitful causes of failure known to the steel industry. It would consequently seem a very wise provision on the part of the American Society for Testing Materials in limiting the sulphur content to a maximum of 0.050 per cent.

Phosphorus Segregation.

In regard to the segregation of phosphorus in iron the writer is of the opinion that there exists in all carbon steels the possibility of the occurrence of three distinct and separate phosphorus compounds. The first of these is shown in Fig. 4, which is a photomicrograph of a very high phosphorus steel, the analysis showing 0.170 per cent. sulphur and 11.08 per cent. phosphorus.

This material had no carbon, manganese, silicon or copper in it. These peculiar crystals seem to be monoclinic and their arrangement is characteristic of this compound of phosphorus and iron. From experiments the writer has made he believes that the formula for this phosphide is represented by the symbol Fe_2P_5 . The magnification shown in the photomicrograph is only 86 diameters. These crystals are very soft and they crumble readily and break in almost any direction. Practically all of them show signs of cleavage transversely, such cleaving planes usually being separated four or five times the diameter of the crystals.

You will readily see from the photomicrograph that this peculiar style of arrangement tends more to structural weakness than probably any other which could be shown.

Fig. 5 shows another phosphide of iron taken from a lower phosphorus steel, where there was no carbon, silicon or manganese present. The sulphur was 0.128 per cent. and the phosphorus was 9.600 per cent. The magnification is 86 diameters, and these crystals are fairly hard and do not easily crush. The writer believes this material to have formula FeP , although some of his experiments led him to believe that the phosphorus content would be sometimes much less than that shown by the above formula.

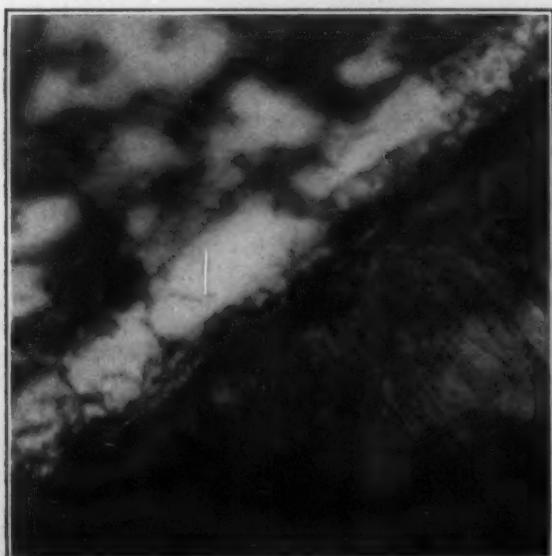


Fig. 8.—Higher Magnification of Sample in Fig. 8 (430 Diam.).



Fig. 10.—Iron Cupride in Copper Steel.

Fig. 6 illustrates another phosphide of iron, a single crystal being shown. This particular phosphide was first shown to the writer by Wirt Tassen as isolated from a meteorite, but the magnification which he used was very much higher than that shown in this photomicrograph, and it suggests the possibility that there is still another phosphide of iron which is sometimes present in which the phosphorus content is as low as the formula shows. The analysis of the specimen shown is: Sulphur, 0.085 per cent.; phosphorus, 3.88 per cent. Silicon, manganese, carbon and copper are absent. The magnification is 340 diameters, and Mr. Tassen states that the formula for this phosphide is Fe_2P_5 .

Manganese Segregation.

The segregation of manganese in cast steel has been for many years one of the most illusive phenomena ever observed by the writer. This element seems to possess the power to combine with sulphur at the high temperature of molten steel, or anything above 1200 degrees C., and to form a very light slag which is immediately thrown to the surface. Instances are on record of material with as high as 400 per cent. sulphur losing 75 per cent. of its sulphur content at once upon the addition of 2 per cent. of high grade ferromanganese stirred into the mixture in the form of a powder. The crystal shown in Fig. 7 is one of a number which the writer has found in cemented steel only under high magnification, and he believes it to be a crystal of manganese sulphide having the formula MnS . These crystals are harder than soft cemented steel; in polishing they stand above the rest of the surface and so take a light, iridescent sheen just before the main surface of the section comes into focus under the microscope.

The photomicrograph in Fig. 7 is from a sample running as follows, the crystal seen being characteristic of this form of manganese compound:

Per cent.	Per cent.
Silicon	0.600
Sulphur	0.175
Phosphorus	0.045
Manganese	0.080
Combined carbon.....	0.82
Temper carbon.....	1.82
Copper	0.08

This specimen is etched with nitric acid.

Silicon and Copper Segregation.

In regard to the silicon content in iron and steel, so far the writer has been unable to isolate, either metallurgically or chemically, any silicon iron compound. Its small percentage of segregation naturally leads us to believe that if the solid solution theory could be applied anywhere it would be more applicable to silicon than to any of the other elements.

In regard to the copper existing in steel, Fig. 8

shows the so-called alloy film in a sample of copper clad steel rod. The copper sheathing of this rod was as nearly pure as it would be possible to get copper, running 99.37 per cent. The steel itself analyzed as follows:

	Per cent.		Per cent.
Silicon	.0.100	Manganese	.0.55
Sulphur	.0.018	Carbon	.0.170
Phosphorus	.0.020	Copper	.0.06

The alloy film itself is shown in detail in Fig. 9, which is simply a higher magnification of the sample shown in Fig. 8, the latter being 430 diameters, while the former is 86 diameters.

Fig. 10 shows a sample of copper-steel containing 0.013 per cent. silicon, with 15.96 per cent. copper, and practically no sulphur, phosphorus or carbon. The crystals shown, the writer believes to be iron cupride, having the formula Fe_2Cu_3 . The specimen is etched with picric acid. The magnification is 48 diameters.

Importance of Metallographic Work.

The investigation of the segregation of the metalloids in carbon steels is certainly one of the most fruitful fields of research open to-day in the metallurgical world. As far as the writer knows, the photographs shown above are the first ever published of the sulphur, phosphorus, manganese and copper compounds of iron as found in manufactured material. The investigation of such phenomena as fatigue will also bring forth results of the most practical nature. From what work the writer has done individually he is led to believe, on account of the inability of any one to isolate the compounds of phosphorus, sulphur, silicon and copper, when these elements exist in percentages of less than those specified by the American Society for Testing Materials, that it seems only probable that perhaps something similar to what is known as solid solution may occur under these circumstances. However, this would be very hard to prove, inasmuch as it would be almost impossible to find these compounds even if they did exist in steels which contained them in small quantities.

The carbon iron compounds are already thoroughly isolated metallographically, and a good deal is known about them chemically. This is so much a matter of common knowledge that it is not worth while to take up time with it now, as all the standard works (particularly that of Floris Osmond) are very comprehensive upon this point.

In conclusion, too much stress cannot be laid upon the importance of a thorough investigation of this subject by a number of independent workers, so that the results obtained may be properly tabulated and inferences drawn, which will be much more comprehensive and correct than are now possible, owing to the small amount of information available at the present time. It seems that in this particular field the most is to be expected out of the investigation which will be made in the future, since the use of iron and steel is becoming more common every day and will become more so, as lumber of all kinds each year is harder to get and the supply more limited. The tremendous reduction in price which has been made within the last three or four years in microscopic apparatus and the ease with which it can be obtained point to a very much greater number of investigators in this field in the near future. To the investigator a knowledge of analytic and synthetic chemistry is absolutely essential if he is to accomplish anything in metallographical investigation. However, this knowledge is so easily obtained, not only in our schools but also in the laboratories of our large industrial plants, that there is every reason to believe that investigations on these lines will be more active and that the results achieved will fully repay the labor and sacrifice.

The Great Northern Ore Properties.—A distribution of 50 cents a share is to be made March 15 to

holders of Great Northern Ore certificates. The previous distributions were \$1 each, September 16, 1907; March 16, 1908, and September 15, 1909. An official of the United States Steel Corporation has been quoted in the past week as saying that the corporation expects to mine from its Hill properties this year 1,000,000 tons and possibly 1,500,000 tons. Comparatively little ore has been taken from these properties thus far, though royalties have been paid on 750,000 tons in 1907, 1,500,000 tons in 1908 and 2,250,000 tons in 1909. The increment is 750,000 tons a year until 8,250,000 tons is reached.

The American Society of Mechanical Engineers.

New York Meeting.

On the evening of March 8 a meeting of the American Society of Mechanical Engineers, the American Institute of Electrical Engineers co-operating, will be held in the Engineering Societies Building, New York, with a paper by H. G. Stott, superintendent of motive power of the Interborough Rapid Transit Company, New York, and R. J. S. Pigott, on tests of a 15,000-kw. steam engine turbine unit. The paper relates to the installation of low pressure turbines at the Fifty-ninth street station of the Interborough Company, and presents a discussion of the most important development in steam engineering since the commercial introduction of the steam turbine. The turbines operate on exhaust steam from the engines with which the station was originally equipped. These are double compound engines of the Manhattan type, with horizontal high pressure and vertical low pressure cylinders. The generators of the engines are capable of safely carrying a load of 8000 kw. each, but the normal economic ratings of the engines is only 5000 kw. The low pressure turbines, three of which are in process of installation, were added primarily to increase the output of the station. By the addition of the turbines, the engines can be run economically up to the full capacity of their generators, and there is besides the current from the turbo-generators, making a total output of 15,000 kw. per combined unit, or nearly double the previous maximum output, and with an average improvement in the economy of 25 per cent. (between the limit of 7000 and 15,000 kw.) over the results obtained by the engine units alone.

Boston Meeting.

The next monthly meeting of the American Society of Mechanical Engineers in Boston will be held on the evening of March 11, in the auditorium of the Edison Electric Illuminating Company. The Boston Society of Civil Engineers and the Boston Section of the American Institute of Electrical Engineers will co-operate in the meeting. The paper will be by M. W. Alexander, who has been so long identified with the educational work and training of the apprentices at the works of the General Electric Company, West Lynn, Mass. The subject of the paper is "The Training of Men—a Necessary Part of the Modern Factory System."

Spring Meeting.

The spring meeting of the society will be held at Atlantic City, May 31 to June 3, with headquarters at the Marlborough-Blenheim. On the evening of June 1 honorary membership will be conferred upon Rear-Admiral Geo. W. Melville, past president of the society.

The David Lupton's Sons Company, Philadelphia, has appointed Geo. P. Heintz & Co., Colorado Building, Denver, Colo., Western selling agents for the territory west of the Missouri River. They will handle the sale of the company's factory specialties, which are the Lupton steel sash, Lupton rolled steel skylight, Pond operating device and Pond continuous sash.

A Large Wheeler Surface Condenser.

Much attention has been given during recent years to the improvement of surface condenser capacity and efficiency, particularly with a view to increasing the heat transmitting capacity of the tube surface, so that a greater volume of steam can be condensed in a smaller space and at a lower cost with less difference in temperature between the exhaust steam and the circulating water. This has been due to the development

designed to produce a 28-in. vacuum when condensing 236,000 lb. of steam per hour, and is one of the dry tube type developed by the Wheeler Company. The essential feature of this model is the interspersing of plates at different levels between the tubes to catch the water of condensation and carry it directly to the sump. In this way no water falls upon the lower tubes and interferes with the transmission of heat from the steam to the water flowing therein.

It has been shown by inserting thermometers in the several water passes of the older types of surface condensers that the greatest transference of heat from the steam to the circulating water occurs through the walls of the first few rows of tubes. With the dry tube arrangement, it is stated, it is possible to make all the tubes nearly if not quite as effective as those in the first few rows of the older type. Heat transmission tests of the Wheeler condensers have shown an increase in the amount of heat transferred per degree of temperature difference of between 600 and 700 B.t.u. per square foot, as compared

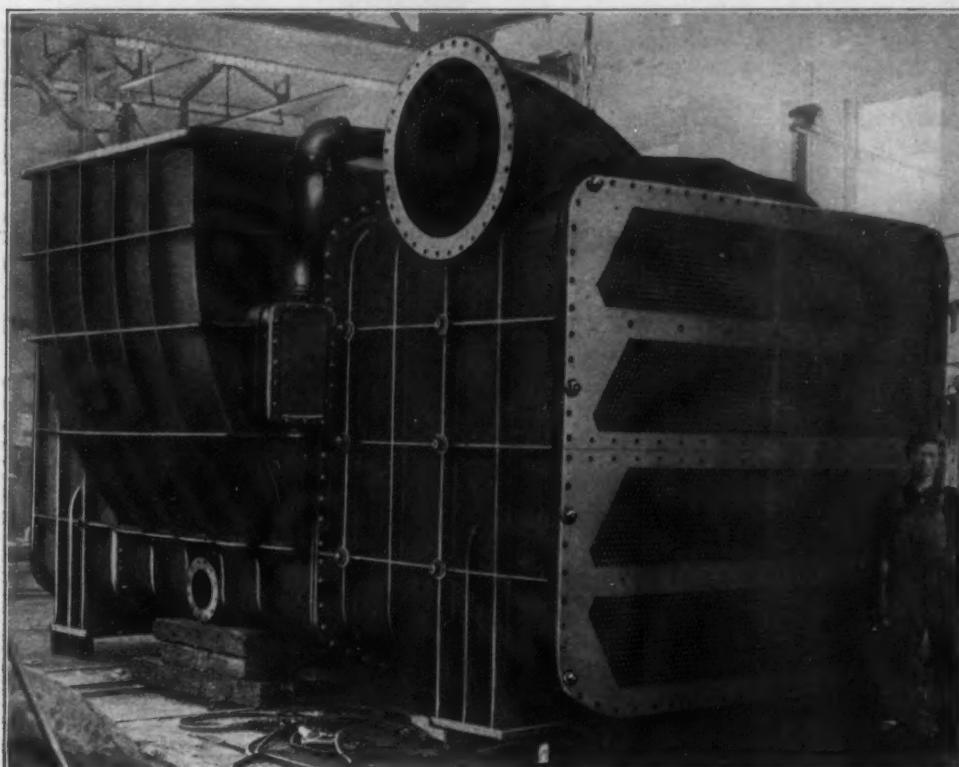


Fig. 1.—A Large Surface Condenser Built by the Wheeler Condenser & Engineering Company, Carteret, N. J.

of the steam turbine as a prime mover, because, for this service, the surface condenser possesses a number of special advantages. Among these are the preservation of the condensed steam, which when freed from oil is the purest distilled water for boiler feed. Thus the expense of purchasing and purifying water is done away with and the boilers are kept free from scale and corrosion. It is stated that a surface condenser will give a higher vacuum than any other type of condenser having an equal air pump capacity, because no air is brought into the condenser by the circulating water. Moreover less circulating water is required with a surface condenser than with the ordinary types of jet condensers.

What is believed to be the largest surface condenser ever built for land service, if not for any purpose, has been recently completed by the Wheeler Condenser & Engineering Company, Carteret, N. J., for installing in connection with a double flow steam turbine built by the Westinghouse Machine Company, East Pittsburgh, Pa., and is shown in Fig. 1. The condenser is

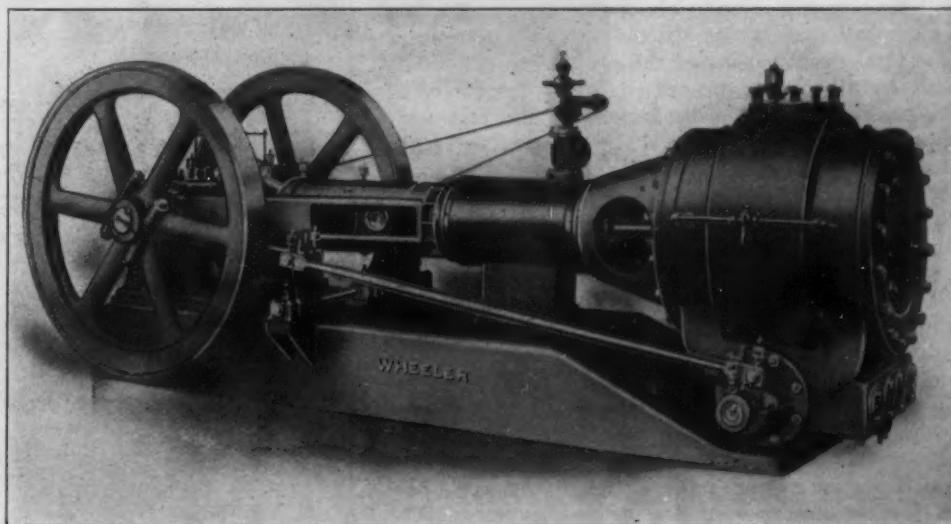


Fig. 2.—The Wheeler 12 x 18 x 30 In. Air Pump Installed with the Condenser Shown in Fig. 1.

with the older types. The steam enters on both sides of the bank of tubes, which gives an exceptionally large exhaust opening and brings the steam into immediate contact with a large extent of tube surface.

The high temperature of the water of condensation is maintained by preventing it from coming in contact with the surface of the lower tubes, which are kept cool by the circulating water. This is important in two ways; the heat absorbing capacity of the circulating water is preserved so that less water is required, and further, all the heat retained in the water of condensation relieves the feed water heater of that much work.

In the present apparatus banks of tubes have been placed in the two inlet passages on either side of the condenser shell where the exhaust from the turbines enters. Turbine driven centrifugal pumps force water through the tubes on its passage from the sump or hot well of the condenser to the secondary heater, thus making two passes through the tubes on each side. The place of the primary feed water heater is taken by these banks of tubes, but by placing the secondary heater within the condenser shell, complexity of piping and the possibility of air leakage due to added joints are both avoided. It will be noticed from the illustration of the condenser that the interiors of the heater tubes are capable of access independently of the condenser tubes.

The condenser is equipped with a Wheeler straight line or fork-frame type of air pump, illustrated in Fig. 2. The steam and air cylinder diameters are 12 and 30 in., respectively, and the stroke is 18 in. The air valves are located at the lower side of the cylinder and consist of a semirotary inlet valve driven by an eccentric on the shaft and poppet outlet valves.

The first is provided with a shifting port which momentarily places the two ends of the cylinder in communication at the beginning of each stroke and eliminates the effect of clearance upon the cylinder capacity. A small amount of air and vapor at atmospheric pressure remains in the clearance spaces at each end of the cylinder after the compressed charge on one side of the piston has escaped through the exhaust valves. This, if allowed to remain, would re-expand as the piston returns to the opposite end of the cylinder, with the result that the piston would complete a portion of its stroke before the pressure would fall to that prevailing in the condenser. As no new air or vapor would be drawn in during this amount of travel, it is obviously wasted.

The by-pass port in the suction valve permits this air and vapor at atmospheric pressure to re-expand at once into the other end of the cylinder, which has been the suction end and is about to become the discharge end, and contains air and vapor at condenser pressure. This later pressure is small, about 1 in. of mercury, and the clearance space volume is only a small percentage of the total displacement of the piston. Consequently practically all the compressed charge in the clearance space passes over to the discharge side and raises the pressure there only slightly. The by-pass port then closes instantly, so that the air and vapor that have passed over are compressed and discharged, together with the other contents of the discharge end of the cylinder. The end of the cylinder which has lately been the compression end and has been converted into the suction end, contains air and vapor at a pressure slightly in excess of that of the condenser. As the forward stroke of the piston is begun the suction end of the cylinder begins to take in a fresh charge from the body of the condenser. It is claimed that with a pump of this type it is possible to produce a vacuum within $\frac{1}{2}$ in. of absolute. The opening for connecting the pump is shown in Fig. 1 below one of the side openings for the entrance of the turbine exhaust. The reason for locating the air pump suction at this point is that air is heavier than steam at the same temperature. It therefore naturally settles to the bottom of the condenser shell, and it is also driven there by the force of the inrushing steam.

Osborn Adjustable Flask-Stripping Molding Machines.

Probably the most important feature of the new flask stripping molding machine that is being placed



Fig. 1.—The Standard Type Flask-Stripping, Molding Machine, Made by the Osborn Mfg. Company, Cleveland, Ohio.

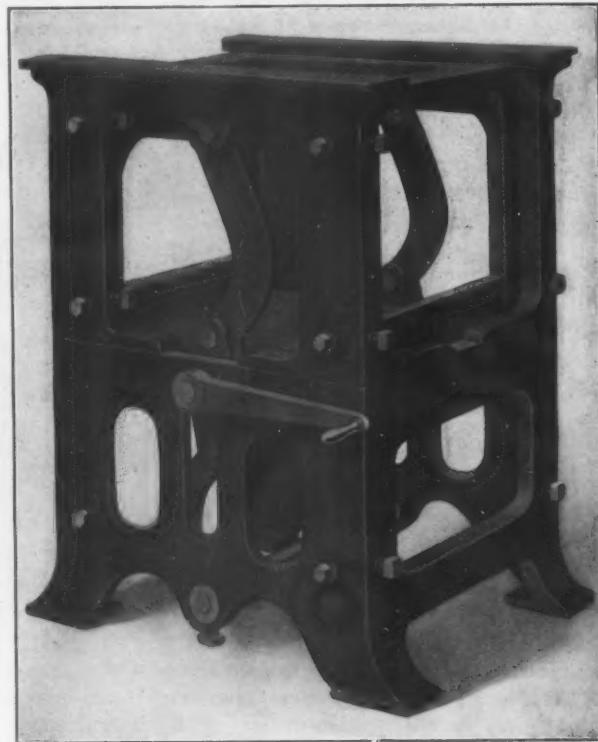


Fig. 2.—A Special 10 1/2-In. Draft Osborn Flask-Stripping Molding Machine.

upon the market by the Osborn Mfg. Company, Cleveland, Ohio, is that it is adjustable to different sizes of flasks. Each size machine is arranged to take four regular widths of flasks, either solid or snap, and 15 different lengths. This machine is the result of an effort to produce a machine that would meet all the re-

The production of pig iron in Belgium in 1909 amounted to 1,632,000 metric tons, of which 1,386,800 tons was Bessemer and basic iron, 89,000 tons foundry iron and 156,590 tons forge iron. The exports of pig iron were 19,000 tons and the imports 477,000 tons. The imports of iron ore into Belgium in 1909 were 4,383,892 tons, as against 3,342,404 tons in 1908, practically all pig iron being made from imported ore.

quirements of practical molding room conditions, and was invented by Charles F. Knowlton and Frank B. Elliot of the Westinghouse Electric & Mfg. Company, Pittsburgh, Pa., where it was thoroughly tried out before being placed on the market.

In the old styles of flask stripping machines it was necessary to have expensive stripping plates and one for each pattern. Moreover, only a limited number of sizes of flasks could be used on these machines. In the Osborn machine the patterns are mounted on plain cast iron plates carrying the flask pins which strip directly from the flasks, thus drawing both the pattern

After the pattern is properly mounted, the flask is placed on the machine with its sides resting on the stationary side supports and its ends on the pattern plate; the flask is located by the pins or holes in the plate. It is then filled with sand and rammed by hand, after which the pattern, plate and pins are drawn down by a turn of the wheel. The draw is secured by a series of folding links, which give a considerable draw in a small space. The guides of the pattern carrier are each made in one piece and are adjustable in all directions to compensate for wear. It is claimed that the machine has a straight, smooth draw, which is assured by the adjustable guides to the pattern carrier, and the quarter bearing of the multiple links upon the upper base of the frame. The machine is built of cast iron and steel, and the parts of machines of similar sizes are interchangeable. The best results can be obtained by having two men to each machine, one on the cope and the other on the drag.

The standard type of the Osborn machine is made in three regular sizes, Nos. 150, 151 and 152, and with these all sizes of flasks can be handled from 9 x 10 in. up to 20 x 34 in. Each side has a maximum pattern draw of 6 in. A total of 96 standard sizes of flasks can be handled on these three machines. The same principle of construction and operation is applied to the other types of the machine. Fig. 2 shows a 10½-in. draft machine made in two sizes, Nos. 155 and 156. These machines are intended for heavier work than the standard machine and are adjustable to flasks from 11 x 11 in. to 20 x 30 in. Fig. 3 gives two views of a special machine, No. 160, designed for making molds that require a long pattern draw, and is intended for still heavier work usually done on the floor. It has a maximum pattern draw of 36 in. and is especially adapted for transformer cases

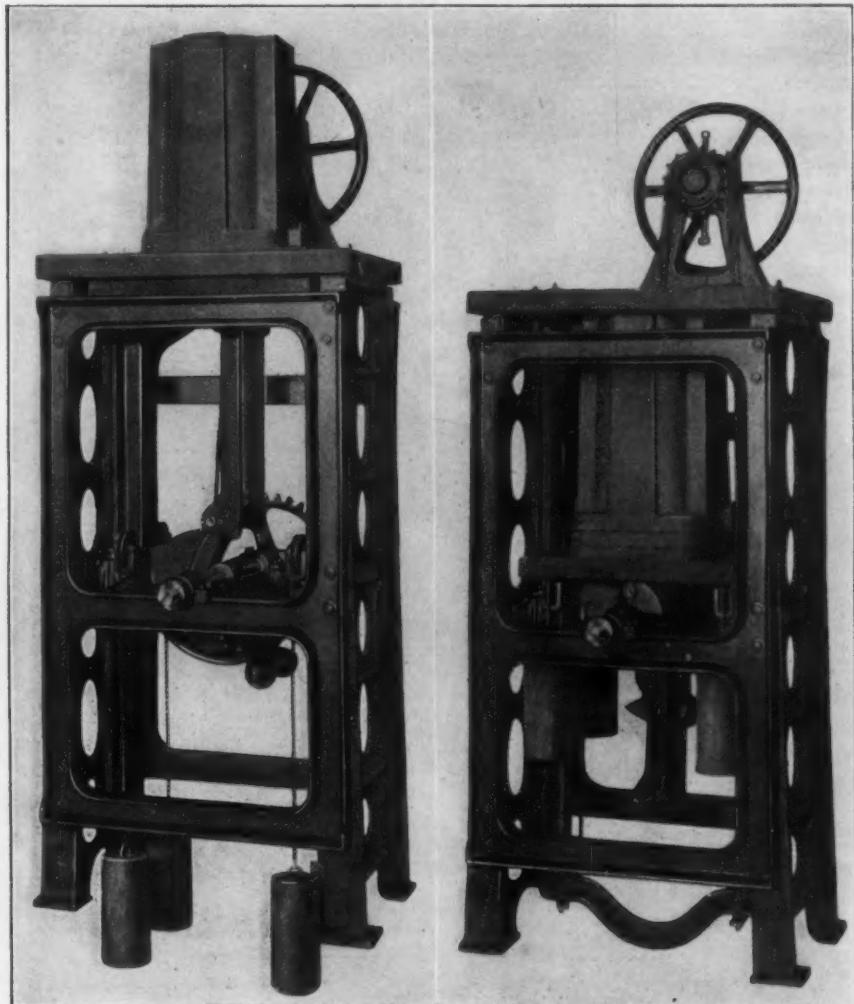


Fig. 3.—The Osborn Special 36-In. Draw Machine with Pattern in Position for Ramming the Cope and Withdrawn.

and the pin in the same operation and avoiding the necessity of expensive stripping plates.

The standard type of the Osborn flask stripping molding machine is shown in Fig. 1. It handles such work as is ordinarily done on the bench, and uses either wood or iron snap or solid flasks. Attached to the top of the frame are adjustable strips which are screwed in place and can each be moved about $\frac{1}{4}$ in. to take up slight variations in the flasks. The flask rests on the top of these strips and the open ends allow any length of flask for each width. The main adjustment of the machine to fit different widths of flasks is made by moving the sides of the machine in or out, which can be done quickly after the screws in the frame and two screws beneath the pattern carrier are loosened. The two parts of the pattern carrier are attached to the sides, so as to move laterally with them, but to slide vertically independently of them, and the correctness of their adjustment is secured by dowel pins that fit in holes accurately spaced. The pattern is fastened on the plate, the length and width of which can be varied according to the size of the flask used. This plate contains either flask pins or holes, as the case may be.

and similar work. It is designed to be placed in a pit, with the drawing table and flask supports set at any desired height above the floor level. This machine will accommodate flasks from 16 x 20 in. to 28 x 36 in., and can be used for castings weighing up to about 800 lb. The left view in Fig. 3 shows the machine with the pattern in position for ramming, and the right one shows it with the cope of the pattern drawn. As may be seen in both views, counterweights are used to balance the pattern.

The Pittsburgh Machine Tool Company, N. S., Pittsburgh, Pa., has appointed the Fairbanks Company and the E. L. Essley Machinery Company, Chicago, as district sales agents. The Pittsburgh Machine Tool Company reports that its contracts for lathes alone will insure steady operations for the coming six months.

Edgar M. Moore & Co., 914 Farmers' Bank Building, Pittsburgh, have been appointed sales agents in Pittsburgh and vicinity by J. J. McCabe, New York City, to handle his New Style double spindle lathe.

Compact Harrison Heaters and Receivers.

A separator to remove the cylinder oil from the exhaust steam before the latter passes to the heating system, and a receiver or return tank to which the water of condensation can be brought before being pumped into the boiler, are among the essential parts of an exhaust steam heating system. The latter usually takes the form of an open feed water heater, and a part of the exhaust steam is employed to reheat the returns to approximately 210 degrees F. before they are pumped into the boiler.

The Harrison Safety Boiler Works, North Philadelphia Station, Philadelphia, Pa., has recently brought out an improved type of heater and receiver, combined with an extra large separator. To keep the separator in use while the heater itself is temporarily out of service for inspection or cleaning a special arrangement of valves is employed. In this way a consider-

change still further reduces the amount of head room required. One end of the heater is covered by the separator and the drainage trap which disposes of the drip from the separator and of the overflow from the heater, both being contained within the casting at the end of the heater, whose shell is constructed something like that of a cylindrical surface condenser. A circular plate closes the end of the heater body proper and contains the port through which the steam enters the heater and the opening through which the waste from the heater overflow or skimming weir escapes into the trap. Bolted fast against the plate is the separator shell, which has the surplus exhaust outlet at one side, and underneath is the stuffing box for the lever which is attached to the float, operating the valve draining the trap.

If it is desired to open the heater for cleaning or

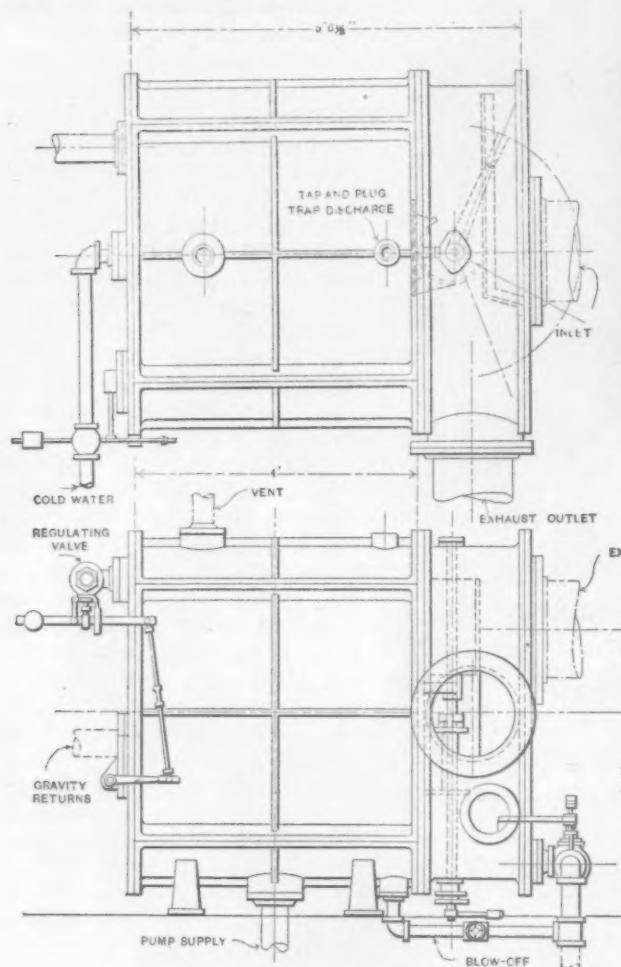


Fig. 2.—Top View and Side and End Elevations of a Heater and Receiver Similar to That Shown in Fig. 1, Built by the Harrison Safety Boiler Works, Philadelphia, Pa.

able amount of space is saved in the boiler room, which is important in all large buildings, since this combination replaces several pieces of apparatus with all their piping. However, in many cases the head room is not sufficient to accommodate the upright rectangular type of heater and receiver, and to meet these conditions a horizontal cylindrical receiver with the steam stack type of separator is supplied.

In the accompanying engravings, Figs. 1 and 2 show the cylindrical type of receiver with the surplus exhaust separator, and Figs. 3 and 4 illustrate a heater and receiver with the exhaust outlet at the top of the separator.

A peculiarity of the apparatus shown in Fig. 1 is that the steam stack is at the side of the separator and not at the top as is ordinarily the case. This

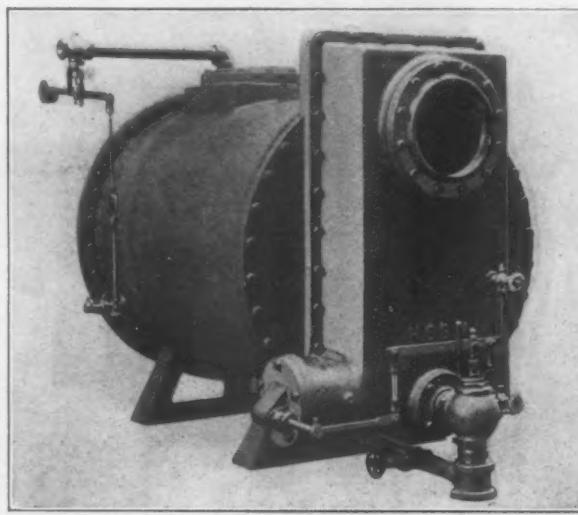
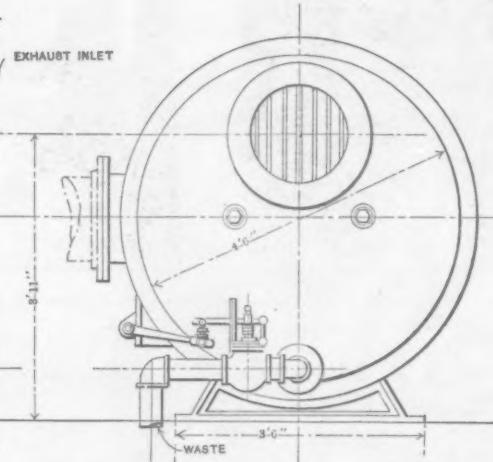


Fig. 1.—A Receiver and Heater for Use Where Headroom Is Limited.



inspecting while the balance of the heating system remains in operation, the separator can be shut off from the body of the heater by operating two semicylindrical valves mounted on a common spindle and thus closing the steam openings simultaneously. The handle for operating these valves is attached to the spindle top and projects horizontally over the top of the heater shell. The baffle plate which arrests the particles of oil and moisture carried by the current of exhaust steam entering the separator is attached to the front cover plate, and the steam passes around one side and then behind the baffle plate. When the valve is open part of the steam is deflected into the heater, while the remainder of the exhaust passes to the surplus exhaust outlet.

The cold water inlet valve and the float mechanism

controlling it according to the level of the water in the heater are located at the opposite end of the shell. The opening for the gravity returns is at this end, also the door for removing the trays over which the water is sprayed in the top of the heater, and the door for removing precipitated impurities and filtering material from the bottom part of the settling chamber.

The other type of heater and receiver differs from the one just described in a number of details. Here the exhaust outlet is at the top of the separator ring, the valves regulating the admission of steam to the heater are arranged on individual horizontal spindles

be used in a number of other locations of a similar nature where exhaust steam is used under back pressure for industrial purposes.

Excess Oxygen Blast for Blast Furnace and Converter.

At a Belgian blast furnace and steel plant, that of the Société d'Ougrée Marihaye, an experiment is to be conducted on a large scale of supplying blast containing an excess of oxygen both to a blast furnace and converter. *Metallurgical and Chemical Engineering*, in commenting on the undertaking, refers to the advocacy of such a process for the blast furnace by J. E. Johnson, Jr., now blast furnace manager at the Thomas, Ala., plant of the Republic Iron & Steel Company. In *The Iron Age* of February 11, 1909, some details were given of the form of blast furnace construction patented by Mr. Johnson, which he suggested for the use, in connection with dry air, of a blast having a high oxygen percentage. The ore and fuel he proposes to charge in separate columns. The gases escaping from the furnace are passed through the incoming body of ore and are kept out of contact with the incoming fuel. It is argued that the oxygen blast would not require preheating; hot blast stoves could be dispensed with, the estimate being that the power requirements for the separation of nitrogen and oxygen would not exceed those for the compression of the blast for the ordinary furnace to 20 lb. pressure. The cost of apparatus for the production of oxygen is put against that for hot

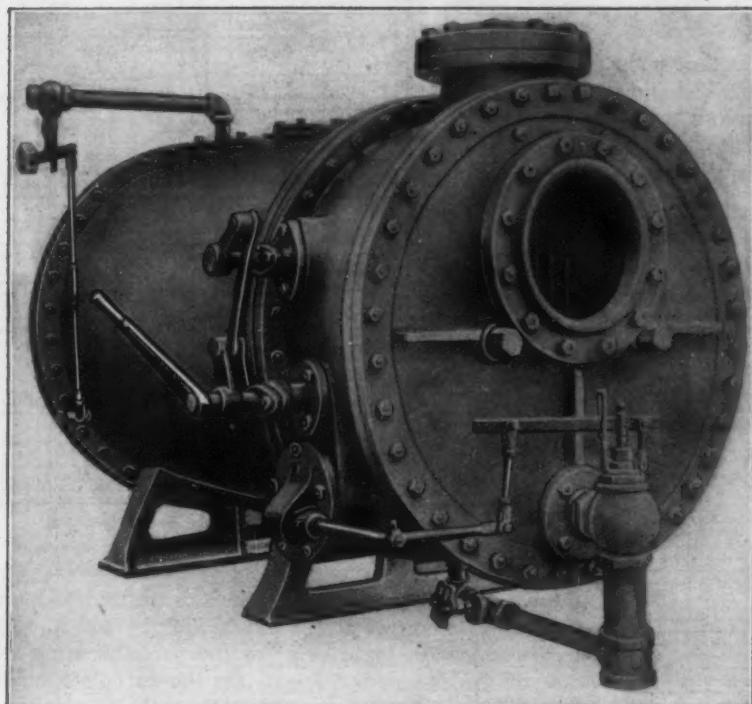


Fig. 3.—Another Type of Heater and Receiver with the Outlet at the Top of the Separator.

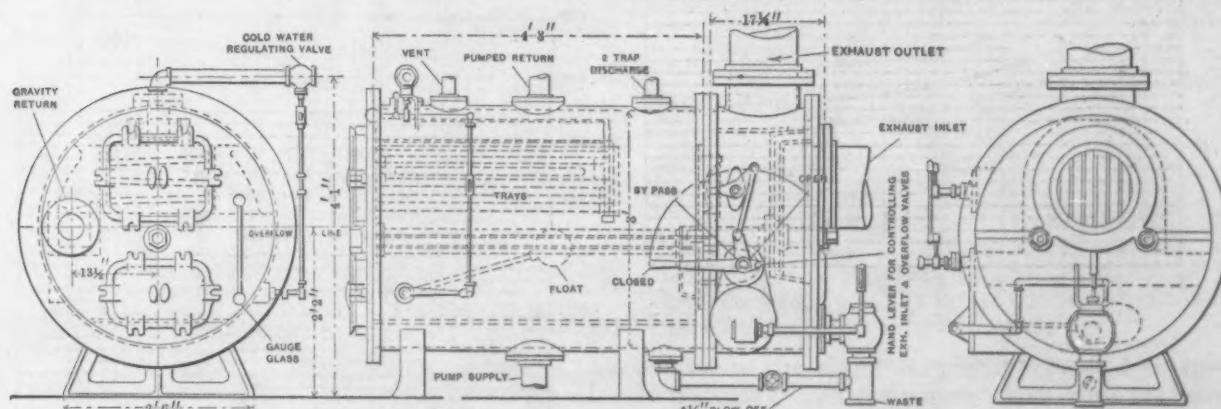


Fig. 4.—End and Side Elevations of the Heater and Receiver Shown in Fig. 3.

connected to a common valve gear and handle, while the cold water inlet valve control float is attached to a spindle passing in through the main heater shell instead of through the rear end plate.

The chief point of interest about this heater, however, is the use to which it has been put. As installed, it is located between a steam engine and an absorption refrigerating machine to eliminate oil from the exhaust steam passing to the refrigerating machine. It receives the condensed returns from the latter and heats these with such make-up water as may be required up to 210 degrees F. for boiler feed. Thus the oil separator is eliminated altogether. That the ammonia generator may be operated at any desired back pressure the heater has been made with a solid shell to withstand a maximum pressure of 40 lb. This heater can

blast stoves, and for the larger outfit of coke ovens required by present practice. It has been predicted that nitrogen elimination will show greater economies than the dry air blast, though naturally data as to the cost of equipment for the former are pure estimates. The Belgian experiment will prove highly interesting.

Consul William W. Canada of Vera Cruz reports the arrival recently at that Mexican port of a consignment of wire from Montreal for use in a Vera Cruz wire nail factory. The shipment consisted of 549 rolls, weighing upward of 36 tons, and arrived in excellent order. Heretofore the importers obtained their stock in the United States, this being the first lot to arrive from Canada.

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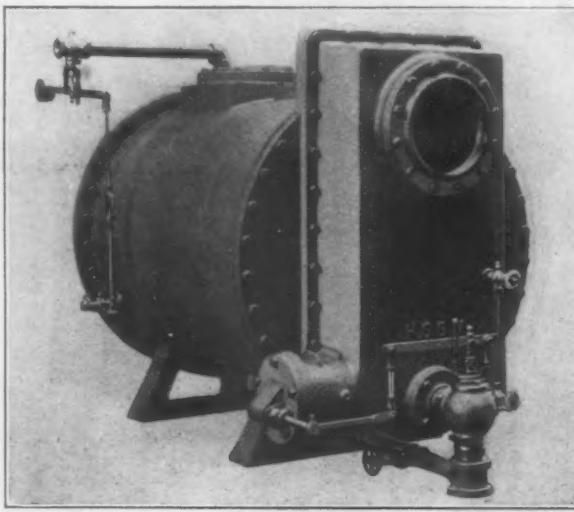


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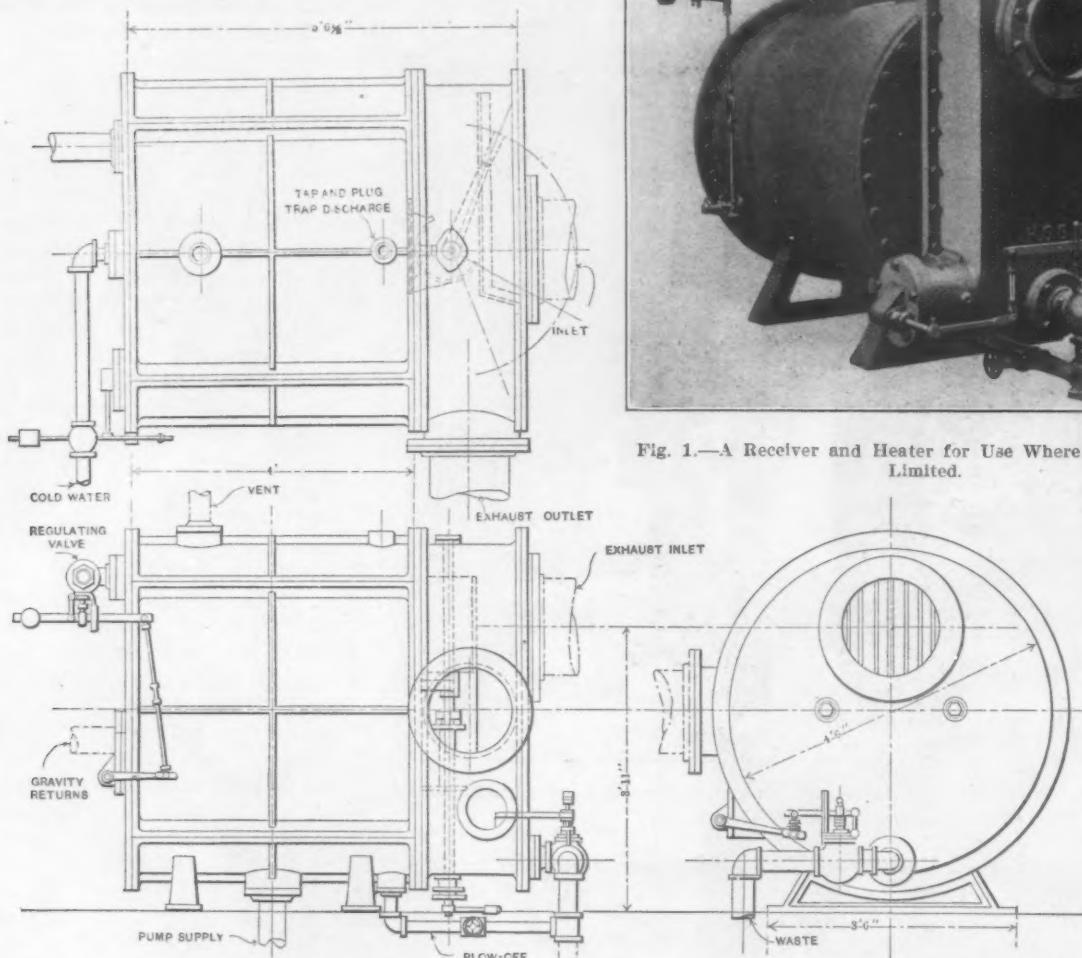


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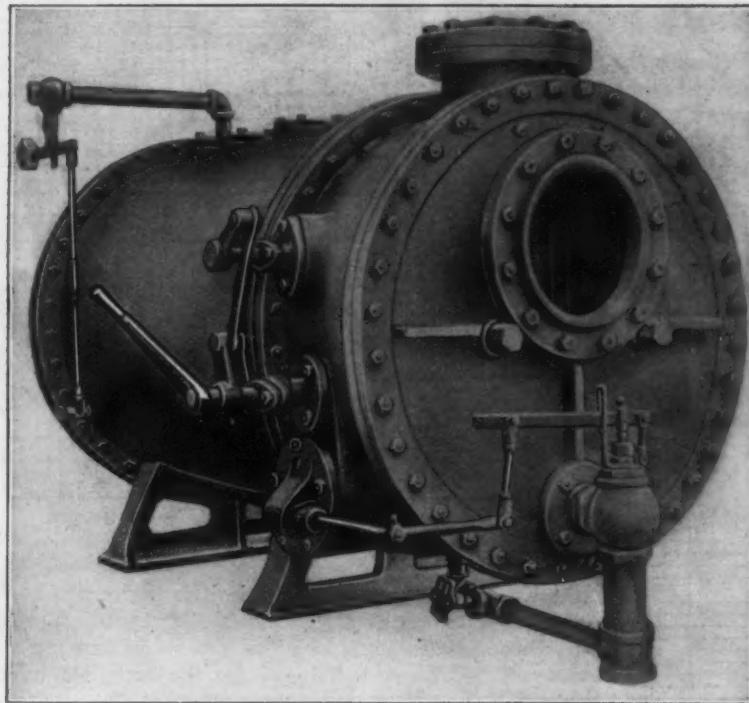


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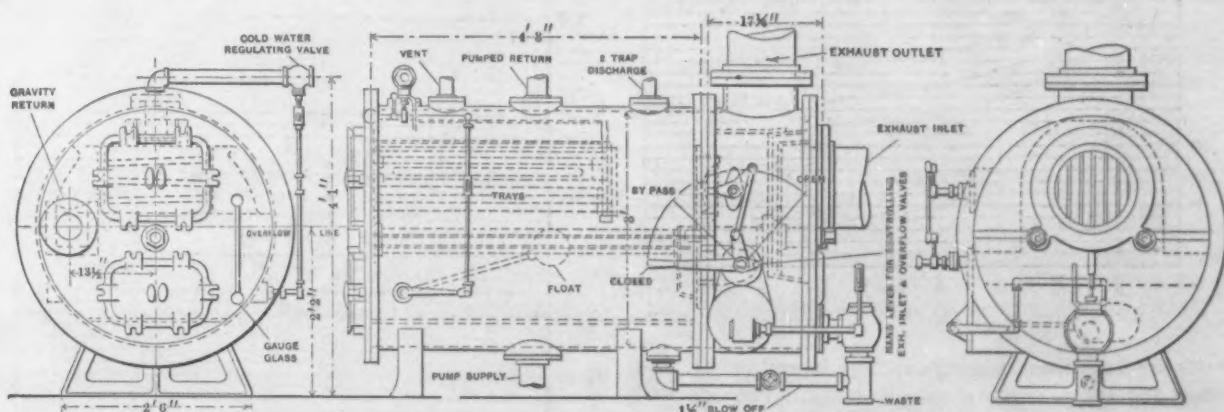


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The chief point of interest about this heater, however, is the use to which it has been put. As installed, it is located between a steam engine and an absorption refrigerating machine to eliminate oil from the exhaust steam passing to the refrigerating machine. It receives the condensed returns from the latter and heats these with such make-up water as may be required up to 210 degrees F. for boiler feed. Thus the oil separator is eliminated altogether. That the ammonia generator may be operated at any desired back pressure the heater has been made with a solid shell to withstand a maximum pressure of 40 lb. This heater can

blast stoves, and for the larger outfit of coke ovens required by present practice. It has been predicted that nitrogen elimination will show greater economies than the dry air blast, though naturally data as to the cost of equipment for the former are pure estimates. The Belgian experiment will prove highly interesting.

Consul William W. Canada of Vera Cruz reports the arrival recently at that Mexican port of a consignment of wire from Montreal for use in a Vera Cruz wire nail factory. The shipment consisted of 549 rolls, weighing upward of 36 tons, and arrived in excellent order. Heretofore the importers obtained their stock in the United States, this being the first lot to arrive from Canada.

Approximate Costs of Mill Buildings.*

BY CHARLES T. MAIN, BOSTON, MASS.

It is sometimes convenient to be able to tell off-hand the approximate cost of proposed buildings, or the cost if new, of existing buildings, without going through an estimate of all the quantities of materials and labor. It is not an uncommon thing to hear the cost of mill buildings placed from 70 cents to a dollar per square foot of floor space, regardless of the size or number of stories. There is, however, a wide range of cost per square foot of floor space, depending upon the width, length, height of stories and number of stories.

Some time ago the writer placed a valuation upon a portion of the property of a corporation, including some 400 or 500 buildings. In order to have a standard of cost from which to start in each case he prepared a series of diagrams showing the approximate

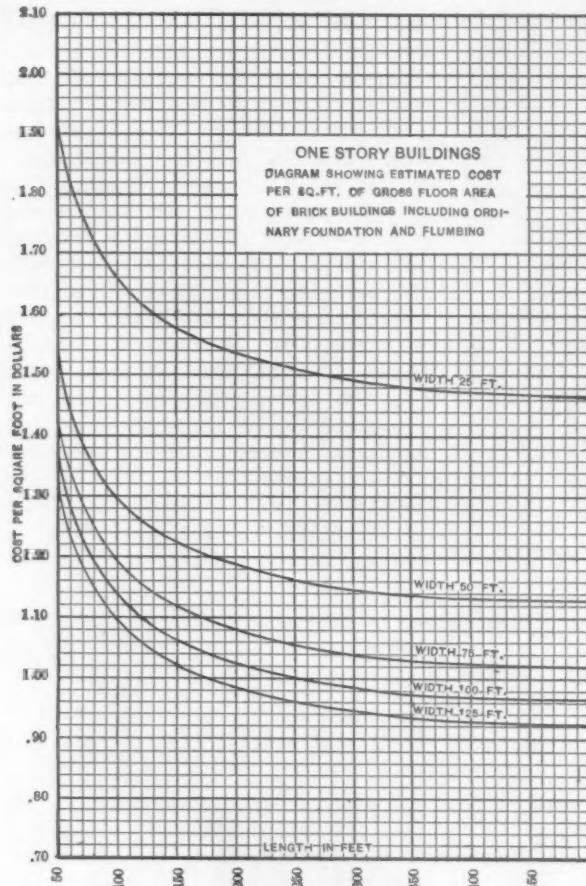


Fig. 1.

costs of buildings varying in length and width and from one story to six stories in height. The height of stories also was varied for different widths, being assumed 13 ft. high if 25 ft. wide, 14 ft. if 50 ft. wide, 15 ft. for 75 ft., 16 ft. for 100 ft. and over. The costs used in making up the diagrams are based largely upon the actual cost of work done under average conditions of cost of materials and labor and with average soil for foundations. The costs given include plumbing, but no heating, sprinklers or lighting. These three latter items would add, roughly, 10 cents per square foot of floor area.

Use of Diagrams.

The diagrams can be used to determine the probable approximate cost of proposed brick buildings of the type known as slow burning, to be used for manufacturing purposes, with total floor load of about 75 lb. per square foot, and these can be taken from the dia-

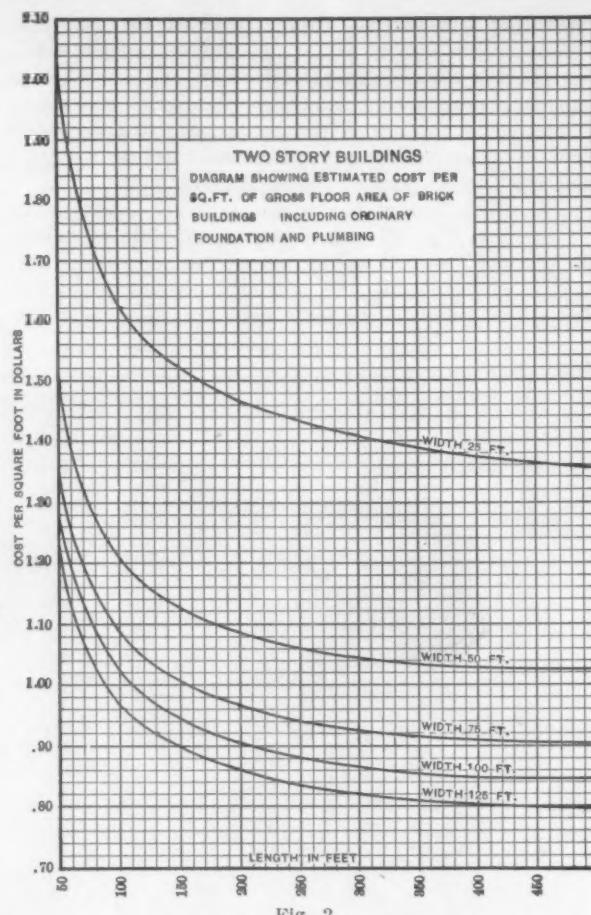


Fig. 2.

grams readily. For example, if it is desired to know the probable cost of a mill 400 ft. long by 100 ft. wide by three stories high, refer to the sheet showing the cost of three-story buildings. On the curve for buildings 100 ft. wide, find the point where the vertical line of 400 ft. in length cuts the curve, then move horizontally along this line to the left-hand vertical line,

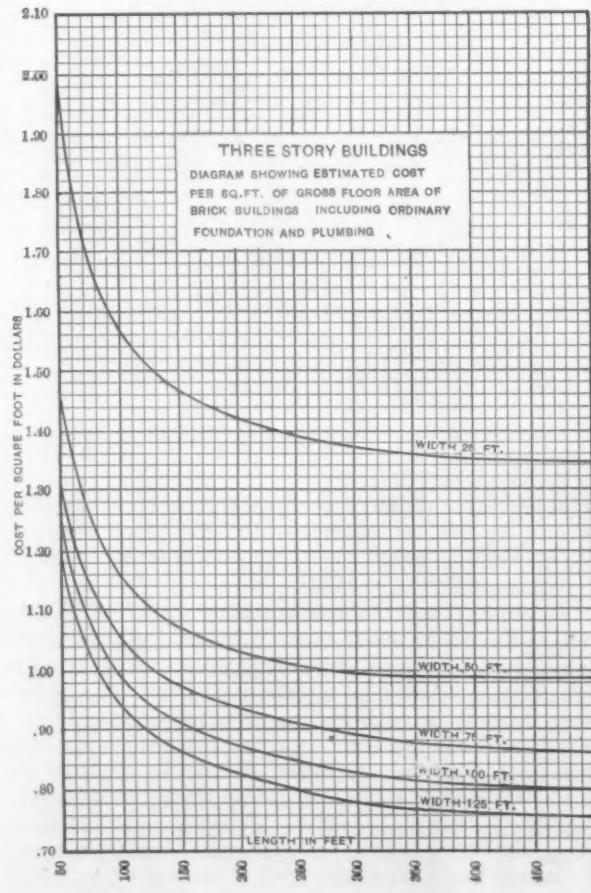


Fig. 3.

* This paper was presented to the New England Cotton Manufacturers' Association, April 28, 1904, and has been revised to meet prices prevailing about January, 1910.

on which will be found the cost of 81 cents. The cost given is for brick manufacturing buildings under average conditions and can be modified if necessary for the following conditions:

If the soil is poor or the conditions of the site are such as to require more than the ordinary amount of foundations, the cost will be increased.

If the end or a side of the building is formed by another building, the cost of one or the other will be reduced slightly.

If the building is to be used for ordinary storage purposes with low stories and no top floors, the cost will be decreased about 10 per cent. for large low buildings, to 25 per cent. for small high ones, about 20 per cent. usually being fair.

If the buildings are to be used for manufacturing purposes

The diagrams can be used as a basis of valuation of different buildings. A building, no matter how built nor how expensive it was to build, cannot be of any more value for the purpose to which it is put than a modern building properly designed for that particular purpose. The cost of such a modern building is then the limit of value of existing buildings. Existing buildings are usually of less value than new modern buildings for the reason that there has been some depreciation due to age and that the buildings are not as well suited to the business as a modern building would be. Starting with the diagrams as a base, the

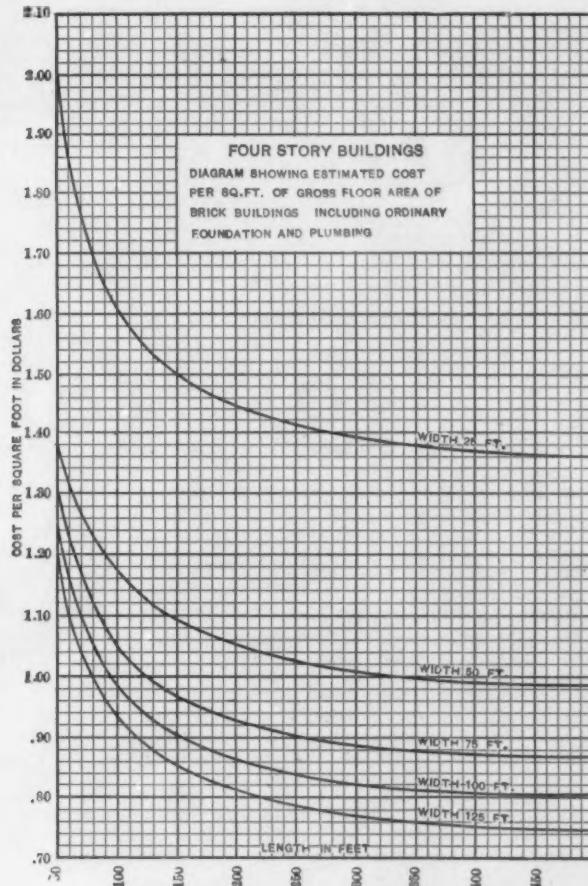


Fig. 4.

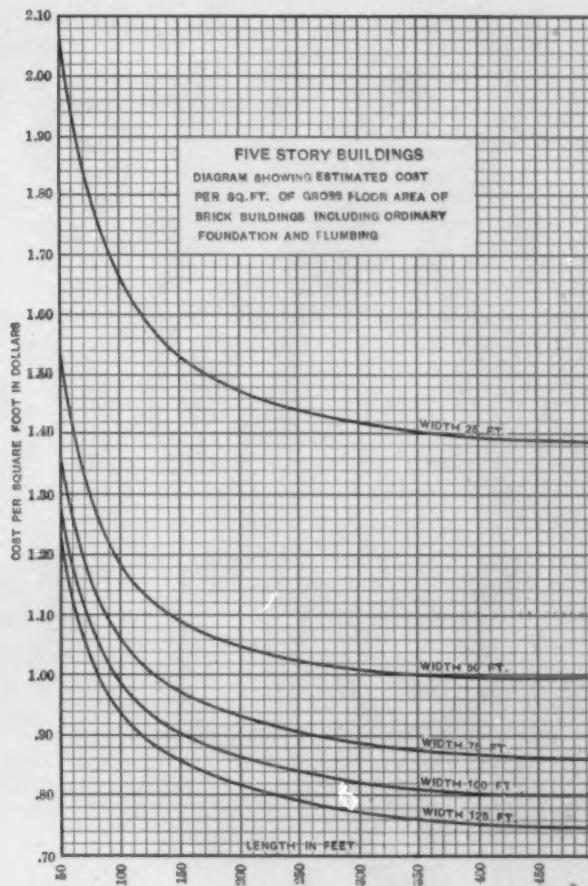


Fig. 5.

and are to be substantially built of wood, the cost will be decreased about 6 per cent. for large one-story buildings, to 33 per cent. for high small buildings, and 15 per cent. would usually be fair.

If the buildings are to be used for storage with low stories and built substantially of wood, the cost will be decreased from 13 per cent. for large one-story buildings to 50 per cent. for small high buildings, and 30 per cent. would usually be fair.

If the total floor loads are more than 75 lb. per square foot the cost is increased.

For office buildings, the cost must be increased to cover architectural features on the outside and interior finish.

The cost of very light wooden structures is much less than the above figures would give. Table I shows the approximate ratio of the costs of different kinds of buildings to the cost of those shown by the curves.

value can be approximately determined by making the proper deductions.

The diagrams can be used as a basis for insurance valuations after deducting about 5 per cent. for large buildings to 15 per cent. for small ones, for the cost of foundations, as it is not customary to include the foundations in the insurable value.

Basis of Estimates.

Table II shows the costs which form the basis of the estimates, and these unit prices can be used to compute the cost of any building not covered by the diagrams. The cost of brick walls is based on 22 bricks per cubic foot, costing \$18 per thousand laid.

Table I.—Showing Ratio of Cost of Buildings Designated Compared with Brick Mills of Standard Construction.

Superficial feet of floor in one story.	Frame mills.						Brick storehouse.						Frame storehouse.					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
	sto.	sto.	sto.	sto.	sto.	sto.	sto.	sto.	sto.	sto.	sto.	sto.	sto.	tto.	sto.	sto.	sto.	sto.
1,250.....	.86	.67	..	..	..	..	.80	.73	..	..	..	..	.70	.51	..	..	..	..
2,500.....	.86	.73	..	..	..	..	.85	.73	..	..	..	..	.75	.58	..	..	..	..
5,000.....	.89	.78	.75	.73	.70	.67	.83	.80	.78	.76	.73	.75	.74	.60	.56	.53	.51	.48
7,500.....	.90	.79	.77	.74	.71	.69	.85	.81	.78	.77	.76	.76	.77	.63	.58	.55	.53	.51
10,000.....	.90	.80	.78	.75	.73	.70	.87	.81	.79	.78	.77	.76	.78	.65	.60	.57	.55	.53
15,000.....	.91	.82	.79	.77	.75	.72	.89	.83	.81	.79	.78	.78	.81	.67	.64	.61	.59	.56
20,000.....	.92	.83	.81	.79	.77	.74	.90	.84	.82	.80	.79	.79	.82	.70	.67	.64	.61	.59
25,000.....	.92	.85	.82	.80	.78	.76	.91	.85	.83	.82	.81	.80	.83	.72	.66	.63	.61	.59
30,000.....	.93	.86	.84	.81	.80	.77	.91	.86	.84	.82	.81	.81	.84	.73	.70	.67	.65	.62
35,000.....	.93	.87	.84	.82	.80	.78	.92	.86	.84	.83	.82	.81	.85	.74	.71	.68	.66	.63
40,000.....	.93	.87	.85	.83	.81	.79	.92	.87	.85	.84	.83	.82	.86	.76	.72	.69	.67	.64
45,000.....	.94	.87	.85	.83	.82	.79	.92	.87	.85	.84	.83	.82	.86	.76	.72	.70	.67	.65
50,000.....	.94	.88	.86	.84	.82	.80	.92	.88	.86	.84	.83	.83	.87	.77	.73	.71	.69	.66

Openings are estimated at 40 cents per square foot, including windows, doors and sills. Ordinary mill floors, including timbers, planking and top floor with Southern pine timber at \$40 per thousand feet board measure and spruce planking at \$30 per thousand, costs about 32 cents per square foot, which has been used as a unit price. Ordinary mill roofs covered with tar and gravel, with lumber at the above prices, costs about 25 cents per square foot, and this has been used in the estimates. Add for stairways, elevator wells, plumbing, partitions and special work.

Table II.—Prices and Other Data Used for Estimating the Cost of Buildings.

	Foundations, includ-		Columns,		
	ing excavations.		Brick walls, including		
	Cost per lin. ft.	For outside	Cost per square foot of surface.	For inside	piers and castings.
One-story building....	\$2.00	1.75	\$0.40	0.40	\$15.00
Two-story building....	2.90	2.25	.44	.40	15.00
Three-story building....	3.80	2.80	.47	.40	15.00
Four-story building....	4.70	3.40	.50	.43	15.00
Five-story building....	5.60	3.90	.53	.45	15.00
Six-story building....	6.50	4.50	.57	.47	15.00

Deductions from Diagrams.

An examination of the diagrams shows immediately the decrease in cost as the width is increased. This

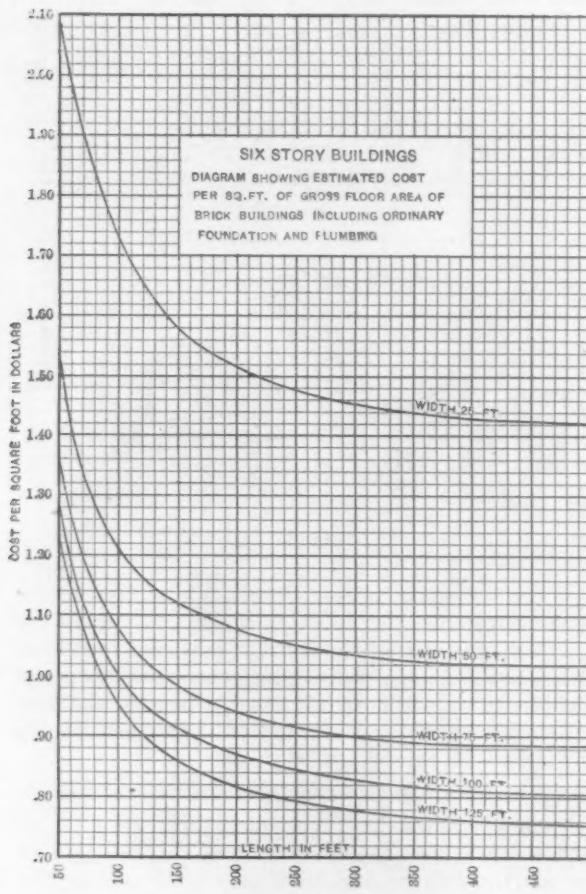


Fig. 6.

is due to the fact that the cost of the walls and outside foundations, which is an important item of cost, relative to the total cost, is decreased as the width increases. For example, supposing a three-story building is desired with 30,000 sq. ft. on each floor: If the building were 50 x 600 ft. its cost would be about 99 cents a square foot; if 75 x 400 ft. its cost would be about 87 cents a square foot; if 100 x 300 ft. its cost would be about 83 cents a square foot; if 125 x 240 ft. its cost would be about 80 cents a square foot.

The diagrams show that the minimum cost per square foot is reached with a four-story building. A three-story building costs a trifle more than a four-story. A one-story building is the most expensive. This is due to a combination of several features:

The cost of ordinary foundations does not increase in proportion to the number of stories, and therefore their cost is less per square foot as the number of stories is increased, at least up to the limit of the diagram.

The roof is the same for a one-story building as for one of any other number of stories, and therefore its cost relative to the total cost grows less as the number of stories increases.

The cost of columns, including the supporting piers and castings, does not vary much per story as the stories are added.

As the number of stories increases, the cost of the walls, owing to increased thickness, increases in a greater ratio than the number of stories, and this item is the one which in the four-story building offsets the saving in foundation and roof.

The saving by the use of frame construction for walls instead of brick is not as great as many persons think. The only saving is in somewhat lighter foundations and in the outside surfaces of the building. The floor, columns and roof must be the same strength and construction in any case.

Reinforced Concrete Buildings.

From such estimates and proposals as the writer has been able to get and from work done it appears that the cost of reinforced concrete buildings designed to carry floor loads of 100 lb. per square foot or less would cost about 25 per cent. more than the slow burning type of mill construction.

Assumed Height of Stories.

From ground to first floor, 3 ft. Buildings 25 ft. wide, stories 13 ft. high. Buildings 50 ft. wide, stories 14 ft. high. Buildings 75 ft. wide, stories 15 ft. high. Buildings 100 ft. wide, stories 16 ft. high. Buildings 125 ft. wide, stories 16 ft. high.

Floors, 32 cents per square foot of gross floor space, not including columns. If columns are included, 38 cents.

Roof, 25 cents per square foot, not including columns. If columns are included, 30 cents.

Roof to project 18 in. all around buildings.

Stairways, including partitions, \$100 each flight.

Allow two stairways and one elevator tower for buildings up to 150 ft. long.

Allow two stairways and two elevator towers for buildings up to 300 ft. long.

In buildings over two stories, allow three stairways and three elevator towers for buildings over 300 ft. long.

In buildings over two stories, plumbing \$75 for each fixture, including piping and partitions.

Allow two fixtures on each floor up to 5000 sq. ft. of floor space and add one fixture for each additional 5000 sq. ft. of floor or fraction thereof.

[From the above data the approximate cost of any size and shape of building can be estimated in a few minutes. After the cost of the items given is determined, about 10 per cent. should be added for incidentals.]

Alternate Method of Estimating Cost.

Table III.—Data for Estimating Approximately the Cost of Mill Buildings. Size Known but No Definite Plans Made.

Height of building.	Brick walls		
	Foundations, including doors and windows.—Cost per square foot of surface.		
	Outside walls.	Inside walls.	Outside walls.
One story.....	\$2.00	\$1.75	\$0.40
Two stories.....	2.90	2.25	.44
Three stories.....	3.80	2.80	.47
Four stories.....	4.70	3.40	.50
Five stories.....	5.60	3.90	.53
Six stories.....	6.50	4.50	.57

Floors.—Thirty-eight cents per square foot of gross floor space. This price will include column piers, column, castings and wrought iron.

Roof.—Thirty cents per square foot, including projection, say 18 in., including columns, &c.

Stairways and Elevator Towers.—Allow two stairways and one elevator tower in buildings over two stories high up to 150 ft. long. Allow two stairways and two elevator towers up to 300 ft. long. Allow three stairways and three elevator towers over 300 ft. long.

Brick walls inclosing stairs and elevators, estimated as inside walls.

Stairs, \$100 per flight per story.

Plumbing.—Allow two fixtures on each floor up to 5000 sq. ft. of floor space, and add one fixture for each additional 5000 sq. ft. or fraction thereof. Allow \$75 per fixture.

Incidentals.—Add about 10 per cent. for incidentals.

It is stated that all available space in the American Shipbuilding Company's yards is engaged six months ahead and that there is no doubt that the tonnage built in this fiscal year, ending June 30, 1910, will exceed that of any other year.

Iron Ores, Fuels and Fluxes of the Birmingham District, Alabama.

The recently published Bulletin 400 of the United States Geological Survey, under the title "Iron Ores, Fuels and Fluxes of the Birmingham District, Alabama," represents the most thoroughgoing treatment ever given to the resources of that district in these important minerals. It contains 204 pages and is illustrated by excellent half-tone plates, geographic and geologic maps, rock sections, and plans and sections of various iron mines. It is the product of three geologists whose studies in the Birmingham district date back to 1904, though the investigations of the United States Geological Survey itself were begun in 1906. The scope of the present work will be indicated by a statement of the part contributed by each of the three authors.

Ernest F. Burchard prepared the bulk of the report. He spent two months in 1906 and one in 1909 in field studies of the Birmingham iron ores and in mapping the rocks associated with them. The chapters he has written describe the red ore beds, with estimates of red ore reserves; discuss mining methods and geologic relations, and describe local brown ore deposits. Charles Butts, from an independent investigation of the general geology and coal resources of the Birmingham region, carried on in 1904, 1905, 1906 and 1908, contributes the chapters on general geology and fuels, with maps and illustrations. Edwin C. Eckel, who was in general charge of the iron ore investigations of the Survey at the beginning of the investigation, but resigned to take up private work, writes the chapters on the origin of the red ores and the brown ores. A feature of the report is a map of the Birmingham district, showing outlines and relations of areas of iron ore, coal, limestone and other economic features. There is also a valuable geologic map of the Birmingham Valley, showing the distribution of the formations and the locations of mines and prospects.

Without going into the details of the methods of computing available iron ore and the deposits not available under present conditions, we give below an extract from the report which deals with the interesting question of the amount of recoverable ore in the Birmingham district:

Ore Supply for 100 Years at Present Rate.

There is thus indicated a total of 358,470,700 gross tons of ore at present available in the main portion of the Birmingham district, and it is probable that 500,000,000 tons would be reached by any estimate that considered carefully the reserves in the other divisions of the district not included within the present estimate. The estimates show also a reserve of 146,024,700 gross tons of ore in the lower bench of the Big seam, and of 292,401,400 gross tons in the main part of the Big seam in the eastern part of Shades Valley—a total of 438,426,100 gross tons of red ore not available under present conditions.

When it is considered that the annual production of red ore in Alabama has not yet exceeded 3,200,000 gross tons, and that the production has not increased rapidly in recent years and does not promise to increase rapidly in the near future, the results of the estimate indicate that the iron ore at present available in this district promises to last more than 100 years longer at the present rate of output. The foregoing estimate, which gives a grand total of 796,896,800 gross tons of red ore in the Birmingham district, as compared with the preliminary estimate of 1,000,000,000 gross tons of red ore in Alabama, previously published by E. C. Eckel, appears fairly conservative, when it is recalled that the Birmingham district probably contains 80 per cent. of the red ore of the State that can be regarded as possibly workable. On the other hand, the preliminary estimate made by Eckel of 1,000,000,000 gross tons of red ore in Alabama, including as it did much in seams at present regarded as too thin to be profitably worked, but of possible future value, appears to be consistently supported by the present estimate of ore reserves in the Birmingham district.

The present estimate is based on the belief that the hard ore beds are the result of a single concentration of iron oxide sediments that took place when the beds were deposited; that they occur as fragments of what were orig-

inally uniform lens-shaped bodies; that, as a consequence of their supposed method of origin, the content of metallic iron does not greatly diminish from the point where the hard ore is first encountered in the mine slopes to the point where the bed has thinned to a minimum workable thickness, and finally, that the structure remains fairly constant as indicated in the foregoing discussions. This last element, it should be remembered, is one of the most uncertain with which the miner has to deal, and can be rendered more certain only by thorough and systematic prospecting with the core drill in places where no definite mine data or reliable geologic indications are available. Unknown structural complications, "horses" of barren rock, and unexpected thinning of the ore beds may, of course, greatly reduce the quantity of recoverable ore counted on in this estimate.

Cleveland Arbor Presses.

One of a line of arbor presses recently placed on the market by the Cleveland Machine Specialty Company, Cleveland, Ohio, is shown in the accompanying illustration. While in use it can be mounted on a lathe, bench or pedestal. The frame is cast iron, of



The No. 3 Arbor Press Made by the Cleveland Machine Specialty Company, Cleveland, Ohio.

box construction, and the lever, pinion and rack are steel. Eight standard sizes of the press will be made, ranging in arbor capacity from $\frac{7}{8}$ in. to 8 in., and in work capacity from 6 in. to 40 in. in diameter. The No. 3 press shown in the engraving is the popular small sized tool. Its capacity is $1\frac{1}{2}$ -in. arbors and work not larger than 12 in. in diameter and 12 in. high. It will exert a pressure of three tons and weighs 108 lb.

Cadwell & Parrock have opened offices in 727 Elliott Square Building, Buffalo, N. Y., representing the Foreign Steel Company of New York City, American agent for J. J. Saville & Co., Ltd., Sheffield, England. The specialties of the new Buffalo firm will be tool steel and power plant equipment and appliances. Special attention will also be given to power plant engineering and installation. The firm is composed of George J. Cadwell, who is president of the Cadwell & Brown Company, Inc., Minneapolis, power equipment engineering, and H. P. Parrock, formerly of Youngstown, Ohio, who has been actively engaged in the iron and steel business since 1901, in the operating departments of the Pennsylvania Steel Company, La Belle Iron Works and Youngstown Foundry & Machine Company.

The Applicability of Electrical Power to Industrial Establishments.*

Economy of Central Power Plants to Serve Groups of Factories.

BY DUGALD C. JACKSON.[†]

In two papers on electrical power for factory purposes, published 14 years ago in the *Journal* of the Western Society of Engineers and the *Transactions* of the American Society of Mechanical Engineers, respectively, the author set forth the status of the then rather new practice of utilizing electrical power distribution in manufacturing establishments. In this paper he proposes to describe the present status of electrical power in factories, and will point out certain remarkable changes which have arisen on account of improvements in methods of using electrical power and improvements in prime movers adapted to driving electrical generators.

A great change has arisen in the attitude of mill and works' owners toward electrical power, following the demonstration of those qualities which have contributed convenience in the arrangement of machinery to save floor space and accelerate output, quicker machine speeds or closer adaptation of speeds to the needs of high grade manufacture, cleanliness in workrooms and safety to employees. First creeping into use as an auxiliary readily added in connection with electric crane service or to operate isolated or special features, electric power has now an established place, and it is needless to discuss its advantages in factory service compared with mechanically distributed power.

Power Distribution.

Whenever available water power is not contiguous to the most convenient factory site, electrical power is essential, because the power of the water may then be conveniently and reliably delivered for use in the most effective manner at the most desirable site. The power of several waterfalls may be converged upon a single factory site, which may be either contiguous or distant. These advantages are effectively utilized by many successful manufacturing establishments and lie at the root of the success of the great power transmission plants constructed for providing a general power supply. Even when water power in large quantities is available directly alongside suitable factory sites, the electrical distribution of the power may play a part of sufficient importance to enable it to supplant mechanical methods on account of its flexibility, which leaves the mill architect free to arrange his factory buildings to suit the requirements of the manufacturing processes untrammeled by those difficulties that always surround the transmission and distribution of power by mechanical means.

In these days of perfected electrical power distribution for factory purposes, boiler and engine rooms (or water wheel rooms) located at various points on the premises have become not only unnecessary but wasteful. A single power house where electrical power is generated for distribution to all parts of the establishment provides a more convenient and economical arrangement. The recognition of this truth is to be observed in the power arrangements of manufacturing establishments in industrial communities from the Atlantic Coast to the Rocky Mountains, where in each more important of the recent establishments has its individual electric power house built with an eye to economy, conveniently located on the property, and therein are located the only prime movers. Steam driven power houses of this character may be located on the most favorable part of the property for the receipt of coal

and supplies and the disposal of ashes, and to prevent inconvenience in the manufacturing processes from the smoke and dirt that ordinarily accompanies the generation of steam power.

The old and ineffective plan of dividing water wheels among several power houses along a canal, where large amounts of power are to be used in an establishment, and adapting the factory buildings to the locations of these power houses may now be replaced by the much more effective arrangement of a single water driven electric power house located at the most advantageous hydraulic position on the canal. The factory buildings may then be grouped and arranged as best suits the requirements of economical manufacturing, without the limitations caused by inflexible mechanical means for distributing the power.

Advantages are thus derived from both the manufacturing aspect and the aspect of power generation *per se* from utilizing electrical power distribution in connection with important industrial plants. Steel works, with their valuable by-product of gas power from blast furnace gases, afford striking instances of the use of comprehensive, unitary works power generating plants under conditions which formerly would have required several scattered power plants.

The Concentration of Power Plant.

The centralization into a single generating plant for any large establishment is accompanied by economies in power generation that are of themselves appreciable, besides contributing to reliability. The question is, how far should such concentration proceed?

Without the electrical distribution of the power, such concentration could not be adequately carried out at all. Moreover, whatever limitations still exist toward improving the economy by completely concentrating the power generation in any industrial establishment, exist with respect to the prime movers and not with respect to the electrical distribution of the power. Where hydraulic prime movers are to be considered, the concentration may ordinarily be made as complete as the conditions of the water supply will permit, since the charges on account of first cost of installation and the labor cost of operating practically dominate the cost of the power developed, and these may ordinarily be expected to decrease per unit of output as the capacity of the plant is increased, under conditions of equal or improved load factor.

An equivalent condition has not heretofore existed where steam prime movers have been used. Since neither labor cost nor steam economy is much improved by increasing a steam electric generating plant over a few thousand kilowatts capacity when reciprocating engines are used, the need of extreme concentration of individual plants has not heretofore been acutely felt, but the advent of large steam turbines has altered the conditions. Plants equipped with these machines installed in connection with boilers provided with adequate labor saving appliances may be operated with labor costs that vie with the labor costs pertaining to hydraulic generating plants equipped with machines of equal size; and the steam economies derived from the newer steam turbines are remarkably satisfactory. Moreover, the first cost per kilowatt of plant capacity, including land, buildings and machinery, falls off in an important degree for the larger steam turbine plants, until such a plant may nearly rival a hydroelectric plant in the gross cost per kilowatt hour of energy delivered at the switchboard, through the fact that the fuel cost pertaining to the steam turbine plant has an offset in the charges caused by larger first cost per kilowatt of capacity of hydraulic plant.

The Great Central Station a Logical Development.

These considerations indicate that concentration of steam electric generating plants will afford considerable economies when it is carried much further than heretofore, provided large steam turbines are utilized as prime movers. The ultimate economy cannot be

* A paper presented at a joint meeting of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers, Boston, Mass., February 16, 1910.

[†] Professor of Electrical Engineering, Massachusetts Institute of Technology, Boston, Mass.

reached in a single factory plant, even when it comprises several thousand horse power and logical development leads beyond the present practice of concentrating the power units of each manufacturing establishment into an individual power plant. Economy and reliability in power service are both to be obtained by further concentrating individual power plants located in a compact industrial center into one or more great central stations each providing power for a number of establishments.

The usual estimate of the cost of power in machine shops is \$60 per horsepower per year—taking the average power during 9 hours a day on the average. The cost is probably that large, as the power in machine shops seldom exceeds 200 hp. and often does not exceed 100 hp. The load factor is also rather low. Under more favorable conditions large reductions may be made. In the case of a mill using an average of 2000 hp. for 24 hours per day, 313 days in the year, the cost per indicated horsepower per hour may be reduced to the following figures if a good compound condensing Corliss engine is used and the firing is intelligently supervised. The cost of coal is put at \$4 per ton on the cars at the purchaser's siding, and it is supposed to cost 25 cents per ton to put the coal in the power house bunkers and dispose of the ashes.

Under the conditions referred to the costs are substantially as follows, per indicated horsepower per hour, in a well run plant:

	Cents.
Fuel, oil, waste and repairs.....	42
Labor	08
Insurance (boiler, liability and fire), interest (at 8 per cent), depreciation and taxes on power plant, including building and land.....	15
Total.....	0.65

This is based on horsepower measured by steam engine indicators on the engine cylinders, and (on account of power losses and other expenses) the cost may be increased 50 per cent. or more for the power mechanically delivered to the centers of use in the mill; in which case the cost would correspond to a central station charge of 1½ cents per kilowatt hour for electrical power delivered to motors of large size carefully located in the mill. When running the same plant 10 hours per day instead of 24, the cost would come to substantially 1 cent per indicated horsepower per hour, and when mechanically delivered to the centers of use the cost of the power may reach a rate corresponding to a central station charge of 2 cents per kilowatt hour. In small plants and those with a less favorable load factor the cost is ordinarily much higher; the illustration taken relates to power generated under conditions particularly favoring a low cost per horsepower for an individual industrial plant.

The mill using 10 per cent. more power at the maximum than is required on the average, and operating 313 days of 24 hours each in the year, gives a 78 per cent. annual load factor based on an installation of a rated capacity equal to the maximum load. If the 10 per cent. by which the maximum load exceeds the average is expected to be carried by the margin in the capacity of the machinery over regular rating, as it properly may be in cases where the extra load only occurs for brief periods when the mill is cold after having been shut down, or for some similar reason, the annual load factor of the machinery is 86 per cent. With a load factor like this a large turbine station can generate electrical power at a remarkably economical rate. It is three times the load factor ordinarily pertaining to electric lighting stations.

Putting this mill on a 9-hour régime for 313 days in the year would bring its annual load factor down to a little over 30 per cent. and increase the cost of the kilowatt hour. The load factors of average manufacturing establishments run less than this, as the power consumption is generally subject to more variations than in the mill that has been chosen for illustration.

Even with the conditions named in this illustration, a large properly designed and built turbine station delivering power to a considerable number of factories ought to be able to improve a little on the power costs and add something to the reliability. The requirements for mill heating and the use of steam in various manufacturing processes often make it impossible to remove the means for generating steam from the factory site, but the generation of steam for power is commonly accomplished separately on account of the different pressures needed for the two purposes, and the separation is therefore a matter to be dealt with as of manufacturing convenience rather than as controlled by economy of steam generation.

Central Power Generation for City Industries.

It therefore seems that we have before us a certain definite character of development in the power generation for our industrial cities. Electrical distribution of power has made its way in factories of all kinds on account of its adaptability to diverse requirements; that is, on account of what we commonly refer to as its flexibility. It has proved particularly advantageous on account of its ready adaptation to delivering power wherever and in whatever position the best interests of getting out the product demand; on account of its joint properties of steadiness and controllability of speed, which have contributed to increasing both the quantity and quality of the product; on account of cleanliness, reliability and safety, which have also strongly commended its use. Its use has also ordinarily proved economical from the standpoint of cost of horsepower applied to the machine shafts. The advantages of flexibility and speed control are being constantly widened by wiser designing of motors and their appurtenances as experience extends. Economy and reliability are being additionally provided in the improved designs and more substantial construction of new power houses.

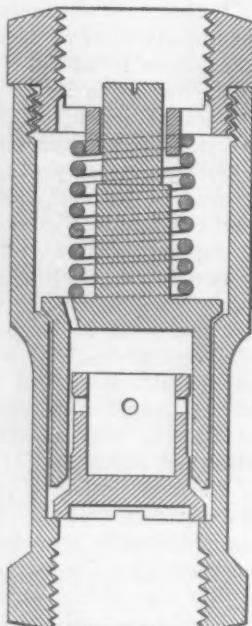
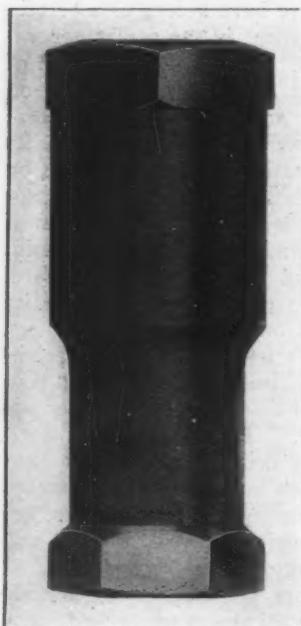
But one of the important possibilities for densely crowded industrial cities is still almost untouched. For instance, in the city of Philadelphia many tens of thousands of horsepower are used for manufacturing in establishments crowded together in city blocks, and the power is developed in separate power plants located, as physical conditions warrant, in each establishment and with a minimum consideration given to economy. Several (perhaps three) large steam turbine electric power houses located on tidewater away from the densely occupied areas and constructed with a careful eye to minimizing the cost of the kilowatt hour could profitably supply this power at figures corresponding with its existing cost, and at the same time release for productive purposes large parts of the very valuable space now occupied by individual factory power plants. This would also relieve the thickly occupied parts of the city from the smoke and dirt that have become seriously objectionable, and would also remove the inconveniences now relating to providing the fuel supply and discarding the refuse. Some of the advantages of concentrating the power supply for large cities have already been urged, and it is unnecessary to discuss them further here.

Much is now being said of "city planning." Some of the proposals seem to be founded on pure altruism, but others are obviously founded on economy. The city planners of crowded industrial cities have an opportunity which joins economy with altruism in studying the applicability of electrical power from centralized generating stations to large and small industrial establishments. There is here an opportunity for the betterment of crowded larger industrial cities that ought not to be overlooked. It has its possibilities also in the smaller industrial cities, and they are larger and more real than appear at first view. This is one of the most important and desirable ways in which the proved applicability of electrical power to industrial establishments may be utilized for the betterment of crowded factory areas.

The Knickerbocker Automatic Hot Water Regulator.

A valve designed to convert an open hot water heating system into one of the closed type automatically, for the development of greater radiation, has been invented by Curtis E. Knickerbocker, and is now being manufactured by the Knickerbocker Valve Company, 90 West street, New York City. Some of the advantages claimed for this valve are an increase of from 25 to 30 per cent. in radiation, a reduction in the sizes of pipes and fittings used and a lower fuel consumption.

In use the hot water heater is connected with the radiators in the customary manner and the usual ex-



Exterior and Sectional Views of an Automatic Regulator for Hot Water Heating Systems, Made by the Knickerbocker Valve Company, New York City.

pansion tank is employed. The automatic valve may be connected in the feed pipe between the heater and the expansion tank, or in the overflow connection at the opposite end of the tank. If very great reliability is desired, it is preferable to install one of these automatic regulators both above and below the tank. Under normal conditions the system is open and the feed pipe communicates with the atmosphere through a constricted compensating discharge passage controlled by a suitable valve. When the system is more vigorously operated to develop greater radiation the temperature of the circulating medium increases and the fluid expands and tends to flow through this passage with sufficient velocity to force the control valve against its seat and transform the system into a closed one. The system may operate in this manner with the heating fluid at such a high temperature that the radiation can be very materially increased above that obtainable from the heating fluid in the open type.

The regulator, as will be noticed from the sectional view, consists of a casing provided with a threaded lower flange and a relief valve mounted inside the casing. The relief valve is normally held against its seat by the pressure of the coil spring above it, which is so proportioned as to allow the valve to lift when the heating fluid has reached a predetermined maximum pressure. The hot water then passes out through the discharge holes shown on either side of the upper end of the valve stem to the discharge or overflow pipe and thus prevents the development of any excessive pressure in the system.

The control valve for the constricted compensating discharge passage is normally held in the open position by its own weight and rests upon the upper edge

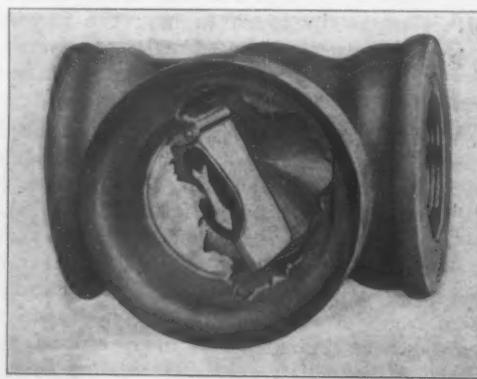
of the lower threaded flange. The walls of this valve are pierced by four $\frac{1}{8}$ -in. holes spaced at equal distances around its circumference. These holes and the annular passage into which they open form a portion of the constricted compensating discharge passage. The expansion and consequent pressure developed on the control valve when the circulating fluid is heated to temperatures approximating the boiling point serves to close the control valve by forcing it tightly against its seat on the lower end of the relief valve. The system thus operates as a closed one as long as the furnace is energetically fired, but as soon as the need of special radiation ceases and the furnace is not forced the temperature and volume of the heating fluid decrease, the control valve automatically drops to the normal position and the system operates as an open one.

Probably the most difficult and sluggish hot water system is that used in heating railroad cars. An average test of a number of such systems in comparison with an ordinary safety valve system gave the following results: At the beginning of the test the temperature at the heater and in the Knickerbocker valve system was 80 degrees, while that in the ordinary safety valve system was 2 degrees higher. At the end of one hour this temperature was the same, although in the interval the temperature at the heater had risen to 240 degrees and that in the Knickerbocker system to 118 degrees. When the test was finished at the end of 1 hour and 45 min., the temperature at the heater was 222 degrees, that in the Knickerbocker system 162 degrees, and that in the ordinary safety valve system 127 degrees.

The Peterson Sight Flow Indicator.

An indicator to show the flow of fluids through pipes has recently been placed on the market by the Peterson Engineering Company, 50 Church street, New York. The device is intended to be inserted in a line of steam, gas, air or water piping to show when the contents are in motion or not. Generally the indication is a visual one, but with the addition of electrical connection it may be given by a lighted lamp or a ringing bell.

The device is of brass and consists of a valve body with inlet and outlet connection. Facing an aperture in the side of the valve body is an adjustable ring with a glass face, in which the indicator is pivoted. This



A Device for Indicating Flow of Fluid Through Pipes, Made by the Peterson Engineering Company, New York.

ring can be rotated to vary the angular position of the indicator vane. When no liquid is flowing, the indicator will tend to hang in a vertical position; as soon as there is a movement of either gas or liquid in the pipe, the indicator will be deflected and this change of position is made as conspicuous as possible by using contrasting colors or black and white for the arrow and the face of the indicator. A contact for the device can be furnished, which will light a lamp or op-

erate a bell or buzzer by closing an electric circuit when the indicator hangs downward, indicating that flow through the pipe has stopped.

The indicator illustrated is for use in a horizontal pipe, but the apparatus is equally suitable for vertical or nearly vertical pipe lines. When so employed the ring is shifted against the direction of the flow so that the indicator will tend to hang transversely to the normal path of flow and be deflected by liquid flowing in the normal direction. The apparatus is then suitable for use in pipes where the flow is upward, but if the flow is downward the piping must be rearranged to provide a length where the flow is either upward or horizontal and the indicator inserted there.

Some of the applications of this indicator are to indicate whether boilers are being properly fed where a large battery is supplied from one main feed line, to show the discharge from pumps, and to show the flow of oil in a circulating system of lubrication. It may also be used to indicate if the cooling water is flowing in water-cooled electric transformers, air compressors and gas engines. When connected in the gas intake pipe of a gas engine, the indicator is sensitive enough to show the pulsation of the gas supplied to the engine.

The Lenix Belt Drive.

In laying out belt drives it is usual to conform, as far as possible, to certain theoretical rules. These, as set forth in text books and engineers' pocket books, have to do with the distance and relative position of the driving and driven shafts, and adherence to them is rather wasteful of space, as the shafts are not supposed to be vertically superposed and the minimum distance between pulleys is 15 ft. where narrow belts are used and twice that for wide ones.

To eliminate or, rather, reduce this waste, the F. L. Smith Company, 50 Church street, New York, has been using a device known as the Lenix. This consists of a belt tightening idler mounted between two arms which swing on an axis parallel and proximate to, or coincident with, that of the driving pulley, and are provided with weights at their free ends. A general idea of its construction can be gathered from Fig. 1, which shows one applied to the belt driving a large diameter cement kominuter through a hole in a partition. Fig. 2 shows diagrammatically a vertical drive where the ratio between the pulleys is 1 to 15. In this illustration the Lenix is represented by *r* and the motor by *m*. Incidentally Fig. 2 shows the concentric Lenix and Fig. 1 the eccentric type.

In operation the Lenix is placed on the upper side of the slack side of the belt and the counterweight is adjusted to give enough tension to cause the belt to

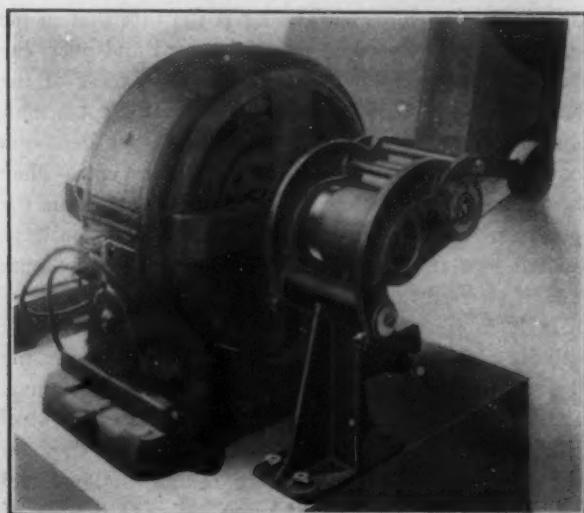


Fig. 1.—The Lenix, a Device Permitting Short-Center Belt Drives, Made by F. L. Smith & Co., New York.

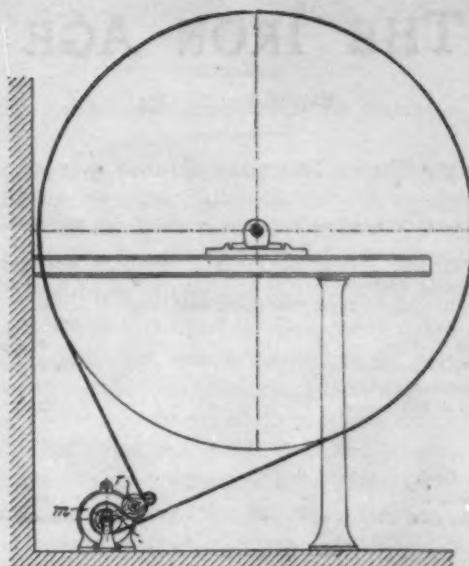


Fig. 2.—Application of the Concentric Lenix Drive Where the Pulley Ratio Is 1 to 15.

grip the pulley face closely. This increases the arc of belt contact and reduces the slip to practically nothing as compared with that present under ordinary circumstances, where high pulley diameter ratios are employed on short drives. In this way it saves power, which is the first advantage claimed for the device. Two tests made on the Lenix demonstrate this feature quite clearly. In the first a 100-hp. motor was connected to a line shaft by a 24-in. double belt in the usual way, with the tension the same whether it was idle or not. The installation of the Lenix on the same drive enabled a 10-in. single belt to be substituted with a tension that was directly proportional to the power transmitted. In another installation, where 140 hp. was to be transmitted between two shafts located almost directly one above the other, and so close that it was impossible to belt directly between them, the driving pulley was belted to a countershaft and thence to the driven shaft by another pulley and belt. With this system, which employed two 15-in. three-ply belts, the amount of power used in overcoming friction was 12.5 hp. The Lenix belt drive was afterward substituted, with the result that a 12-in. single-ply belt was able to transmit the same amount of power with a reduction in the friction loss of 77.6 per cent.

Another advantage claimed for the Lenix is that it reduces the amount of floor space required by enabling the prime mover and the driven machine to be placed closer together. In one instance where a dynamo was belt-driven from an engine, the driving and driven pulleys were located 16 ft. apart and were 5 ft. 6 in. and 1 ft. 5 in. in diameter, respectively. A double belt 12 in. wide was employed and the arcs of contact were 196 degrees for the driving pulley and 164 degrees for the driven, with a frictional loss of 2.953 hp. and a loss due to slip of 2.37 hp. The substitution of the Lenix drive reduced the distance between the centers of the same two pulleys to 6 ft. 6 in. and increased the arcs of contact to 239 degrees for the driving pulley and 243 degrees for the driven one. A single-ply 10-in. belt could then transmit the required power and the losses from friction and slipping of the belt were reduced to 1.24 hp. and 0.132 hp., respectively.

The statistics of the American Railway Association show that the net surplus of freight cars on the railroads of the country on February 16 was 14,309, as against 24,975 on February 2, 26,844 on January 19, and 38,416 on January 5. The increased demand for box cars and coal cars has been sufficient to call into service all the idle rolling stock of that kind.

THE IRON AGE

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The Control of Violence by Strike Leaders.

The offer of the Philadelphia street car strikers to man cars carrying the mails is suggestive; it is particularly so, coupled with the statement that if the traction company refuses to make such arrangements the responsibility for interference with the mails will be upon it and not upon the strikers. It will be recalled that in the Chicago railroad strike, when Federal troops were called out, the men led by Debs similarly offered safe conduct out of the Chicago yards to trains carrying the mails. In the great strike at the Homestead works of the Carnegie Steel Company in 1892, when armed strikers patrolled the company's property, it was explained on their behalf that they were there to protect the works.

There is a certain grim humor in these assurances from labor union sources, when taken in connection with the claim so often made that strikers themselves do not commit violence. We have been told that it generally proceeds from the crowd attracted by a labor trouble, if it does not even come from persons employed by proprietors to stir up violence and thus bring the strikers' cause into disrepute! But there is a very serious side to this matter. If strike leaders are able to insure safe conduct to mail trains or mail cars manned by their adherents, it is a fair conclusion that they are able to stop the riotous attacks upon such cars when manned by the authorities or by employees of the company against which the strike is directed.

A parallel to the offer made by the strikers at Philadelphia last week is found in what happened in the midst of the serious strike in the Cincinnati foundries several years ago. The officers of the Iron Molders' Union, after several conferences with the National Founders' Association had been without result, asked that the officers of the association make one more visit to Cincinnati. It was insisted by the association that meantime violence should cease and that the mobs gathering about the foundries of several of the Cincinnati members should leave the streets. This was agreed to by the president of the Iron Molders' Union. The violence did stop and the gathering of men in the streets ceased. This was brought about, indeed, within a few hours after the agreement for a truce had been made. In the conference that ensued, a representative of the Iron Molders' Union is reported to have boasted of his ability to quiet the mob and to maintain law and order during the continuance of the truce.

Very pointed testimony to the ability of labor union leaders to arouse or to control the militant spirit of their followers was given by President Gompers of the American Federation of Labor at Washington last week. After an interview with Attorney-General Wickesham in which Mr. Gompers forcibly voiced the displeasure of his organization with the Moon bill to regulate injunctions, he made this threat:

If our constructive and conservative labor movement is outlawed it will give way to another movement not constructive and not conservative in character.

It may occur to some to ask when we have had the constructive and conservative labor movement to which Mr. Gompers refers. Are we to understand that the boycotts which he and other officers of his organization have instigated are a part of it? Or is it connected with the outbreaks of violence which the labor leaders in the various cases cited have found themselves able to suppress or control when occasion seemed to require? There will hardly be any great curiosity concerning the "movement not constructive and not conservative" which we are told may come later. A certain amount of bluster has come to be expected from men in Mr. Gompers' position, and we are not asked to classify it as either constructive or conservative.

The Steel Rail Statistics for 1909.

The first impression made by the statistics of steel rail production in 1909 is that the total was greater than had been expected; the next, that the open hearth rail has made much more rapid progress than might have been looked for. The very moderate increase last year in the number of freight cars built—from 76,555 in 1908 to 93,570, which was less than one-third the total of 284,188 cars in 1907—was an indication that rail buying was likewise of much smaller proportions than in 1907. The total of 3,062,582 gross tons, or 59 per cent. more than in 1908, was more than 84 per cent. of the total of 3,633,654 tons in 1907 and 77 per cent. of the record total of 3,977,887 tons in 1906.

That many railroad engineers have turned to the open hearth rail as a solution, in part at least, of the troubles that have been so prominently under discussion in the past three years is plainly indicated by the statistics. Open hearth rails were more than 40 per cent. of last year's total, or 1,255,961 tons out of 3,062,582 tons. More surprising is the fact that in the heavier rails, those of 85 lb. to the yard and over, the open hearth product was 70,000 tons in excess of the Bessemer product, or 917,987 tons against 847,553 tons. The ability to raise carbon above 0.60 per cent.—on 100-lb. rails as high as 0.70 or 0.75 per cent.—when phosphorus is held below 0.04 per cent., commends the open hearth rail to those railroad engineers who have insisted that the steel manufacturer give a maximum of both strength and wearing quality.

It is interesting to see that the open hearth rail, with its comparatively small increase in cost over the Bessemer, is resorted to so largely to meet the demands of the severe present day service, and that alloy steel rails have as yet scarcely become a factor. The statistics divide the 50,505 tons of so-called alloy steel rails into 35,945 tons of titanium rails, 1028 tons of manganese rails, 12,287 tons of nickel chrome rails and 1245 tons of electric steel rails. It is a question if the

titanium and electric furnace rails should be so classified. In the case of the former the titanium added in the form of ferrotitanium is not ordinarily incorporated in the steel, but passes into the slag, its effect being the removal of oxygen and other gases, causing the steel to lie quiet in the molds and to roll well.

Time will be required to demonstrate whether too large expectations have been built upon the open hearth rail. Already the Rail Committee of the Maintenance of Way Association has intimated that those who looked for great things from the changes in sections made in 1908 have met some disappointments, particularly with the new heavy base rails. Chemistry, section and rail mill methods may all contribute to a stronger and better wearing rail, but, as was pointed out by the late President Dudley of the American Society for Testing Materials, these will not make up to the railroads what they could have secured by draining subgrades and giving the rail proper support in track.

The Graphic Chart in Cost Systems.

The graphic chart as an adjunct of the cost system is employed with most useful effect in some industrial works. It tells quickly and intelligently the story of business in its various phases. No better means of deduction has been devised, not only by comparison of present with past conditions, but in the relations of the several factors which are essential in understanding the market and conditions within the works themselves. In one plant, which includes machine shop and foundry, the system is made up of several charts, with curves plotted monthly, from a beginning in 1902. For example, one chart shows gross sales in red ink, accounts payable in green, accounts receivable in purple and cash in black. Essentially important information is obtainable at a glance from the relations of these curves one to another. If the ratio between the volume of business and accounts receivable is getting high, the question may be asked if customers are going ahead too fast and are buying in a speculative way. If, on the other hand, the ratio is seen to be getting low, the indication may be that general business is contracting and people are liquidating, in their doubt as to the immediate future. The ratio between cash and bills receivable is another source of valuable deduction, showing, perhaps, that the company is paying its bills faster than customers are making remittance, or that it is buying too much and expanding too rapidly, or that too cautious a policy is being pursued. The combination of curves of sales and labor costs and overhead expense frequently gives information which the management can employ to good effect. And so such a system may be carried through the cost records, as owners may apply its usefulness.

Charts are so accessible that they are consulted much more constantly than other forms of record, which would give similar comparisons. They serve to make a manager watchful. They act as an automatic check on his judgment. A valuable feature of the chart is that it shows relative conditions without revealing actual figures to foremen and others to whom it is not advisable to tell just how business stands, but in whom an interest is created by the system. While at first glance the chart may appear complicated and even cumbersome, to those who use it the lines are

as clear in their meaning as type. Its maintenance requires little labor.

The American Exposition in Berlin.

For some time the outlook for the proposed American Exposition, to be held in Berlin the coming summer, has not been promising. This was not due to a lack of interest among American manufacturers, but to the unfavorable attitude of German commercial and manufacturing interests. It must be admitted that the purpose of this exposition was to familiarize the people of Germany with American products, possibly to demonstrate the excellence, the variety, the ingenuity and the adaptability of American goods and thus promote the trade of American manufacturers. The prospect of a commercial undertaking of this character has apparently not been pleasant to German manufacturers and they have not hesitated to express their disapprobation. This was shown by the declination of an expected official connection of the Imperial German Government with the exposition.

At a meeting of the American Executive Committee of the proposed exposition, held in this city on Monday, the subject was thoroughly discussed and at the close of the meeting announcement was made that the exposition has been abandoned for this year, although one may be held in 1911. The committee announces that if such an exposition is held it may be advisable to make it an affair in which the people of both countries should participate, and thus prove that it is not intended to be an American industrial invasion. The majority of the members of the American committee are expected to visit Berlin the coming summer for the purpose of bringing about, if possible, such a German-American exposition.

To establish an enterprise of this character would require the most careful management to preserve thoroughly amicable relations and allay German opposition. Competition for trade is a species of warfare, no matter how it may be disguised. In fact, nations engage in war for the direct purpose of promoting or defending their commercial or manufacturing interests. It is by no means surprising that German interests should oppose anything like official sanction of what would seem to be an effort to establish more thoroughly competing trade relations in their country. It will be remarkable indeed if the project should be successfully carried out, even if an attempt is made to conduct it on the basis of participation by both German and American manufacturers.

CORRESPONDENCE.

Patents on Multiblade Fans.

To the Editor: Following so closely the recent decision of Judge Hough of the United States Circuit Court, in which he sustained the fundamental patent covering the Sirocco or multiblade type of centrifugal fan or blower against a demurrer attacking its validity, the English patent decision mentioned in the following from an advice sheet sent to our branch offices may prove of interest to your readers:

An important comment upon the patent situation appears in the decision of the Comptroller General of the English Patent Office, dated November 22, 1909, on the application of the Electric & Ordnance Accessories Company, Ltd., maker of the so-called Ordnance fan in Great Britain for a patent on an alleged improved type of blade for the Ord-

nance fan. In the argument leading to his decision the following words are used:

"It is clear that Davidson's fan, as far as the official search has gone, stands alone and constitutes a great practical advance, and for all practical purposes it would appear to be the first fan of the multiblade type in which comparatively long and narrow blades are used. Any one conversant with the workings of such machines would understand the specification as applying and applying only to the Davidson type. The illustrations given in the drawings of both specifications represent, in my opinion, Davidson's fan and no other."

"It is clear, therefore, to my mind that the applicant has taken Davidson's fan and made what he declares to be improvements on the blades; but the whole foundation or substratum of his invention is Davidson's mechanism. This may be disguised, but is, in my opinion, the real effect of a proper construction of both specifications read together."

Wherever the phrase Davidson fan is used above is meant the Sirocco fan as manufactured by Davidson & Co., Ltd., Belfast. The decision of the Comptroller-General on the above application was that a patent was granted for the improved form of blades, but only after the applicant had inserted in said patent admission of the priority of Davidson's patents, which, in effect, means that Mr. Davidson's consent is requisite to the use of the patent.

It is interesting to note that the above decision of the English Patent Office follows within a month the decision of Judge Hough in this country on the demurrer in our action against the B. F. Sturtevant Company now pending.

We would suggest that those interested in the application of fans for ventilating and mechanical draft, might well keep informed as to the patent situation.

In granting the basic Sirocco patent, the Board of Examiners-in-Chief of the United States Patent Office said:

The fan has been proved to be very largely more efficient and much less noisy than fans of other types of the same size. We are disposed to allow all claims which indicate the distinctive features and functions of the fan in order that the patentee may have a standing in court which will call for a determination of the most extreme breadth of his invention.

Sirocco fans are manufactured in the United States solely by AMERICAN BLOWER COMPANY.
DETROIT, MICH., February 17, 1910.

Barium and the Fusibility of Blast Furnace Slag.

To the Editor: I noted with interest Mr. Sweetser's article in *The Iron Age* of February 3, 1910, on the effects of BaO on blast furnace slag, and while the details he gave are interesting I am inclined to think that Mr. Sweetser has attributed too great an effect to such a small quantity of BaO (2.45 per cent.). In Colorado in making spiegel we used manganese ores containing a small variable quantity of BaO, and occasionally there was as much as 4 per cent. BaO in the slag; but we never noticed any particular difference in the fusibility of the slag whether 4 per cent. of BaO or only 1 per cent. was present, provided the percentage of Mn remained about the same.

The first mention of the use of BaO to lower the melting point and to increase the fluidity of a slag that I have been able to find is in an article in *Le Génie Civil*, by Pourcel, on the manufacture of ferromanganese, published in 1873. He had present both CaO and MgO, and he added a quantity of BaO (8.50 to 9.20 per cent.) on the well known principle that when additional bases are introduced into a slag the melting point is lowered.

In Colorado I had to use as a flux a pure calcite, and the addition of a small amount of BaO probably did lower the melting point a trifle, but the quantity introduced (up to 4 per cent.) was insufficient to make it noticeable. Mr. Sweetser reports 5.10 per cent. of MgO, and this is where his increased fusibility and fluidity lay, and the combined BaO and MgO (7.55 per cent.) are sufficient in amount to account for all the phenomena mentioned. While it is true that a silicate of magnesia is more refractory than a silicate of lime, yet the compound silicate of lime and magnesia is much more fusible than either alone. In Southern basic practice a dolomite is used either alone or mixed with calcite in

order to get the requisite fusibility and fluidity while keeping the slag basic; and in Cornwall practice, with dense refractory magnetites, high in sulphur, where the ore carries 7 per cent. of MgO, when using a pure calcite as flux, we often run for months on a slag containing 42 per cent. $\text{SiO}_2 + \text{Al}_2\text{O}_3$, with 8 to 12 per cent. MgO, without any difficulty whatever. Indeed the slag is no more refractory than the ordinary 48 per cent. $\text{SiO}_2 + \text{Al}_2\text{O}_3$ slag and much more fluid. When a magnesian limestone has to be used the combined $\text{SiO}_2 + \text{Al}_2\text{O}_3$ have often to be reduced to 40 per cent., and even to 38 per cent. if the sulphur in the coke or ore happen to be higher than usual. The MgO will amount to 17 or 18 per cent., and the influence of the MgO in increasing the fusibility is so great that such a slag is not as refractory as the ordinary slag of 46 per cent. acids with no MgO present, but such more fluid. Such a slag leaves an almost clean runner; only a few drops of slag here and there remain on the dry bottom. The great amount of MgO present is really a nuisance, because when necessary to get a slag sufficiently refractory for some purposes so much stone has to be added that the slag volume is inconveniently large and the consumption of coke increased; consequently a pure calcite is much preferred.

In replacing CaO by MgO there is undoubtedly a point where the fusibility curve will rise, but it is certainly above the point where the MgO is one-third the total amount of base present; or, expressed in another way, 18 per cent. of MgO in an ordinary slag (containing 38 to 48 per cent. $\text{SiO}_2 + \text{Al}_2\text{O}_3$) does not render it more refractory than a calcite slag containing several per cent. more acids, while it does make it more fusible.

R. H. LEE.

LEBANON, PA., February 21, 1910.

Municipal Ownership.

To the Editor: About three months ago I answered an article in *The Iron Age* concerning the success of municipal ownership in this city. My article was in reply to some one who had attacked municipal ownership upon the grounds that it had proved a failure almost every time it had been tried.

I inclose a statement showing the success of the municipal lighting plant of the city of Owensboro. This plant started in nine years ago with an investment of \$65,000. In nine years the plant has grown to such an extent that the actual value of the buildings, machinery, equipment, poles, wires, &c., amounts to \$325,000. The plant is not bonded and does not owe any one anything. During the nine years of its existence this plant, allowing the usual rate of interest on the money invested in it each year, charging up all costs of maintenance, management and every other species of expense, has made for the city of Owensboro \$325,000. It has not alone done that, but has furnished the city with its own street lights at a cost of about one-half what was formerly paid for the same class of service and furnished its citizens with light on the basis of five cents per kilowatt for the highest charge and two and a half cents per kilowatt for the lowest, depending upon the quality of current consumed per month.

Before the establishment of the municipally-owned plant the cost of current here was from 10 to 15 cents per kilowatt, and at that we only had light after 6 o'clock and on very dark days, but not 24 hours a day, as is the case now. The operation of the municipal light plant had the effect of reducing the price of illuminating and fuel gas from \$1.50 per 1000 cu. ft. to a flat rate of \$1 per 1000 cu. ft. for all purposes, whether lighting or fuel.

What the city of Owensboro has done under proper management, with the proper City Council and Board of Light and Water Commissioners, to safeguard the operation of the plant, and who also prevent the greed of political organizations from disturbing a properly

organized municipal lighting and water plant, we believe presents a condition that cannot be excelled by any city. Municipal ownership in this case has certainly been successful, and municipal ownership under proper management will be equally as successful in other cities.

This city also owns and operates its own water plant. This plant is about half paid for, the balance of it being a bonded debt. Up to this time the municipal water plant has not shown any profit, but it has given to the people of this city an abundance of good, pure water at less than half they paid a privately owned plant. The city is soon to install a water softening plant, so that the water will be of an ideal quality for all purposes, and under the same careful management will prove as successful in time as has the electric light plant.

J. ED. GUENTHER.

OWENSBORO, Ky., February 19, 1910.

[NOTE BY THE EDITOR.—The statement alluded to above, as having been inclosed, presents the figures for each of the nine years, showing a progressive growth in income and gain, 1909 representing the cost of the plant as practically extinguished. It is certainly an admirable showing.]

The Pelton-Francis Turbine.*

To meet a condition which has arisen from the fact that the most readily convertible sites for tangential water wheel plants have been taken up and improved upon by the hydroelectric transmission companies, and that future developments along these lines would be largely confined to lower pressures, the Pelton Water Wheel Company, San Francisco, Cal., some 10 years ago began designing a water turbine. Another feature which had to be considered was the great strides being made by electrical manufacturers in the increase of the unit size of alternating current generators, higher speed, and the fact that the closest possible regulation was essential to the modern long distance transmission plant. With these considerations in view, coupled with the demand for a highly efficient turbine under varying loads, the Pelton-Francis turbine was evolved, which in its construction shows an adherence to the application of well-known theories rather than a radical departure from the principles of the Francis type wheel.

This turbine is of the radial inward flow, reaction type built in either horizontal or vertical units for direct connection to alternators. A special composition of bronze is employed for the runners, which are inclosed in a special spiral casing designed to neutralize eddy effects and to impart a constant velocity to the water as it enters the chutes.

A special form of relief valve of radically different design from the ordinary relief valves heretofore employed in hydraulic power plants is attached to the turbine to overcome the great difficulty formerly experienced in obtaining satisfactory speed regulation from turbine water wheels, especially those operated under high pressures and feed by long pipe lines. This valve does not depend upon a rise of pressure in the penstock or pipe line for its operation, but is coupled to and acts in synchronism with the speed governor. When the load drops, the governor naturally tends to close the turbine gates to a point corresponding to the load. This reduction may vary from 1 to 100 per cent. of the total unit capacity, and the sudden arresting of the flow of water in a long penstock would greatly jeopardize the safety of the latter besides playing havoc with the speed regulation of the wheel. Pelton relief valves are, however, actuated by the governor, and an oil dash-pot mechanism is attached to the latter, so that the relief

valve, after restoring normal pressure to the pipe line, slowly closes, thus insuring economy in the use of water. To further improve regulation heavy steel banded flywheels are keyed to the wheel shaft.

Among the notable plants employing Pelton-Francis turbines are the 20,000-hp. installation of the Schenectady Power Company near Schaghticoke, N. Y., where there are four units; the Black Hills Traction Company, South Dakota, employing 1000-hp. turbines under 110-ft. head; Sultepec Light & Power Company, 800-hp. turbines at 900 rev. per min. under 340-ft. head; municipal plant, Eugene, Ore., 1200-hp. turbines, 300 rev. per min. under 45-ft. head; and Utah Light & Railway Company, 5000-hp. turbine, 300 rev. per min. 126-ft. head.

The Empire Steel & Iron Company.

The annual stockholders' meeting of the Empire Steel & Iron Company was held in Jersey City, N. J., Wednesday, February 23. About 70 per cent. of the stock was represented, and the retiring directors were re-elected for another year. The annual report was not given out for publication, but President Leonard Peckitt stated that the total net earnings from the operations amounted to \$326,759.62, which, after making what were considered liberal allowances for improvements, permanent repairs and depreciation of mining properties, left a net profit for the year of \$217,813.61. He also stated that during the year the full 6 per cent. dividend had been paid on the preferred stock.

The mining properties in New Jersey turned out 215,063 gross tons of high grade ore, far exceeding any previous year's output. The present rated capacity of the blast furnaces is 300,000 tons per annum, but on account of business depression during the first half of 1909 several stacks were idle. The total production of pig iron amounted to 171,400 tons. At the present time 88 per cent. of the furnace capacity is in active operation. Orders for pig iron were reported to be coming in at a fair rate, and the outlook for the future was regarded as encouraging.

The following is a condensed balance sheet of the company's affairs as of December 31, 1909:

Assets.	
Real estate, plants and machinery.....	\$3,593,513.17
Stocks and bonds.....	1,071,869.30
Cash in banks.....	\$229,674.25
Notes receivable.....	169,000.00
Accounts receivable.....	105,662.01
Pig iron inventory.....	14,215.15
Raw materials, supplies, &c.....	<u>409,982.00</u>
	928,533.50
Total.....	\$5,593,915.97

Liabilities.	
Preferred stock.....	\$2,500,000.00
Common stock.....	1,254,770.00
	<u>\$3,754,770.00</u>
Accounts payable (current invoices).....	\$187,031.75
Pay rolls.....	36,810.25
Dividend No. 22, payable January 1, 1910	75,000.00
Fund for depreciation of property.....	\$614,721.76
Fund for bad debts.....	<u>17,001.65</u>
Profit and loss.....	631,723.41
	908,580.56
Total.....	\$5,593,915.97

At the meeting of the Pacific Northwest Foremen's Association at Seattle, Wash., February 12, J. N. Linton read an interesting paper on the "Application of Chemistry to Manufacturing." Many questions were asked in the discussion that followed. J. W. Ittner, superintendent of the Aggutter-Griswold Company's plant, Seattle, described the work of the Foremen's and Superintendents' Club of Chicago, of which he had been a member. President James of the association gave an address on some phases of foundry practice emphasizing the benefit to be derived from the use of chemistry in the mixing of iron and in determining the quality of materials.

* This turbine was described in considerable detail in an article dealing with an installation for the Schenectady Power Company at Schaghticoke, N. Y., in *The Iron Age*, July 15, 1909. The facts here given may be taken as supplementary to the previous description, which should be referred to for the exterior and sectional views given of the turbine.

Lignite as Boiler Fuel.

Remarkable Results Shown in Pumping Plant Tests.

One of the most modern and efficient pumping stations in the South is that of the San Antonio Water Supply Company, which furnishes water for the city of San Antonio, Texas. Within the past few years this station has been equipped with new pumping machinery, and a very marked increase in efficiency has been obtained. The station is chiefly notable as one using either lignite or oil as fuel directly under steam boilers, and has given favorable results in both cases, as may be seen by comparing the tests given later; the first was with lignite and the second with oil. High grade fuel is very expensive in the Southwest; consequently lignite, which is found in considerable quantity in certain sections, can be very advantageously used where satisfactory results are obtainable, and oil in that particular locality is even cheaper. Success, particularly with lignite, however, requires both good equipment and close, careful management.

The plant above mentioned was originally designed to take water from the springs at the head of the San Antonio River. Owing, however, to the failure of these springs, about 20 years ago, it became necessary to seek a new source of supply. After several unsuccessful attempts water was obtained from driven wells which are located near the present pumping station. These wells are about 880 ft. deep and have a capacity at present of approximately 80,000,000 gal. per day, which is about four times the greatest demand that has been made on the plant so far. Bacteriological examinations and chemical analyses show that the water from the wells is of excellent quality, and it is also perfectly clear.

The water reaches the pumps at a pressure of about 12 lb. per square inch and at a temperature of about 78 degrees F. During normal conditions the delivery pressure of the pumps is about 92 lb. per square inch, giving a net head for the pumps of 80 lb. In cases of fire this delivery pressure is increased about 10 lb. The engines pump directly into the mains, a reservoir of about 5,000,000 gal. capacity taking care of the surplus water pumped.

The Equipment.

In 1902 the San Antonio Water Supply Company purchased a vertical triple expansion pumping engine having a capacity of 15,000,000 gal. in 24 hours. This pumping engine was guaranteed, when operating under contract conditions, to develop a duty of 140,000,000 foot-pounds for each 1000 lb. of dry steam furnished to the engine. It was tested and turned over to the water company in July, 1904. The official duty test showed a duty of 172,700,000 foot-pounds per 1000 lb. of dry steam. In 1908 a second vertical triple expansion pumping engine was purchased from the same builder, Allis-Chalmers Company, having a normal capacity of 20,000,000 gal. in 24 hours and maximum capacity of 24,000,000 gal. in 24 hours. This engine was tested and turned over to the water company in September, 1909. The official duty test showed a duty of 171,800,000 foot-pounds per 1000 lb. of dry steam.

These pumping engines are similar in design and are of the vertical triple expansion crank and flywheel condensing type. Each cylinder has its piston rod connected to a steel crosshead, and from this crosshead four steel tie rods extend to the plungers, which are single acting outside packed. The pump valves are of rubber $3\frac{1}{2}$ in. outside diameter and mounted in groups on removable cast iron cages. The condensers are of the surface type, located directly in the main suction pipe of the engine, thus using all the water pumped for cooling purposes. The air pumps are of the vertical single acting type and are driven from the crosshead of the low pressure plunger. The condensed steam

flows by gravity from the condenser to the air pump. The steam cylinders have the valves in the heads. The barrels are jacketed. Large receivers are placed between the high pressure and intermediate cylinders and between the intermediate and low pressure cylinders.

On the 15,000,000-gal. unit the high pressure and intermediate pressure cylinders each have a single eccentric to operate the valves, the low pressure cylinder having Corliss admission and poppet exhaust valves. The receivers are fitted with reheating coils. The main engine frames are of the single box A type. The steam cylinders of the 20,000,000-gal. pumping engine have two eccentrics each, and the low pressure cylinder has both inlet and exhaust valves of the poppet type. There are no reheating coils in the receivers and the main frames are of the latest round column type. Another difference between the two engines is in the arrangement of the jacket piping. For the smaller unit the steam used for jackets and reheating coils is supplied by a by-pass around the throttle valve and is kept separate from the steam used by the main cylinders. The pressures carried in the jackets are somewhat higher than those in the cylinders. In the larger unit the steam for the intermediate and low pressure jackets is taken from the working charge in the first and second receivers, respectively.

The equipment which has been superseded by the new pumping engines consists of a triple expansion high duty Worthington pump, six belt driven Gould pumps and a Sioux-Corliss engine for driving the latter. While this apparatus will probably never be used again, it is kept in working condition and could be put in service at any time. Either of the new pumps has sufficient capacity to supply practically all the water that is needed, and it is seldom necessary to operate more than one of them at a time. The old equipment is, therefore, retained merely as emergency protection. The boiler plant consists of three 250-hp. Cahall vertical direct fired water tube boilers of standard type except for the addition in the furnaces of sprayers for using oil. The steam pressure carried is 150 lb. per square inch.

The Trials.

The official duty test of the first of these engines was made by Dr. Arthur C. Scott, professor of electrical engineering at the University of Texas, Austin, Texas. The second test was made by Dr. Scott and B. E. Kenyon, both connected with the engineering department of the University of Texas. No attempt was made to carry out a complete boiler trial in connection with these trial runs, but a partial evaporative determination was made during the test of the first engine. Two boilers rated at 500 hp. were used and were operated much below their nominal capacity, as they served to supply steam for the main engine and two small pumps only. These results, however, are of unusual interest, as lignite was used for fuel in the first test. A sample of this fuel gave the following analysis:

	Per cent.
Moisture	14.4
Volatile combustible matter.....	40.6
Fixed carbon.....	30.1
Ash	14.9
Total.....	100.0
Sulphur	1.6

The following is a summary of the boiler results with lignite:

Steam pressure in boilers by gauge, pounds.....	151
Total amount of lignite consumed, pounds.....	39,450
Moisture in lignite, per cent.....	14.4
Dry lignite consumed, pounds.....	33,769
Percentage of ash to dry coal, per cent.....	14.9
Total weight of water evaporated (corrected for moisture), pounds.....	133,328
Temperature of feed water, degrees F.....	78.9
Water actually evaporated per pound of dry lignite from actual pressure and temperature, pounds.....	3.94
Equivalent water evaporated per pound of dry lignite from and at 212 degrees F., pounds.....	4.6
Dry lignite actually burned per square foot of grate surface per hour, pounds.....	14.6

The following summaries indicate the excellent showing made by these two pumping engines during the official tests:

Date of test.....	July 16-17, '04	Sept. 1-2, '09
Duration of test, hours.....	24	12
Fuel used.....	Lignite	Fuel oil
Diameter of cylinders, inches.....	24 & 46 & 68	26 & 50 & 74
Stroke of engine, inches.....	42	48
Diameter of plungers, inches.....	29½	30½
Stroke of plungers, inches.....	42	48
Average steam pressure at engine, pounds.....	150.98	152.21
Average first receiver pressure, lb..	34.3	29.8
Average second receiver pressure, lb.	0.18	1.0
Average vacuum, inches of mercury..	28.13	27.136
Average barometer, in. of mercury..	29.28	29.228
Average net head pumped against, ft.	71.07	80.45
Average revolutions per minute.....	28.417	30.663
Piston speed, feet per minute.....	198.919	245.464
24-hour rate of water pumped, gal..	15,256,237	20,123,446
Total moist steam used by engine, lb.	122,233	91,525
Average moisture in steam, per cent.	1.1	0.925
Total dry steam used by engine, lb..	120,839	90,679
Average indicated horsepower.....	459.65	714.6
Average delivered horsepower.....	444.04	655.82
Average friction mechanical and hydraulic, horsepower.....	4.4	8.2
Average moist steam per horsepower, pounds.....	11.07	10.67
Average dry steam per horsepower, pounds.....	10.95	10.57
Mechanical efficiency, per cent.....	95.6	91.8
Duty per 1000 lb. moist steam, foot-pounds.....	170,800,000	170,200,000
Duty per 1000 lb. dry steam, foot-pounds.....	172,700,000	171,800,000
Total B.t.u. chargeable to engine....	136,838,000	101,696,939
Duty per million B.t.u.....	152,500,000	153,200,000

C. G. Hussey & Co. Extend Their Copper Business.

C. G. Hussey & Co., proprietors of the Pittsburgh Copper & Brass Rolling Mills, Pittsburgh, Pa., have purchased the copper business of the Crucible Steel Company of America. This business was established in 1859 by Park, McCurdy & Co., afterward Park Steel Company, and later acquired by the Crucible Steel Company of America. The business was a large one, all sizes of sheets in copper and brass being made. The sale includes all stocks held in about 10 cities of the United States and Canada.

C. G. Hussey & Co. have been established in the manufacture of copper and brass in Pittsburgh since 1847. The product includes sheet copper in all sizes and finishes, copper conductor pipe, eaves trough, elbows and shoes in copper, copper ridge roll, copper and brass rivets, copper washers, corrugated copper gaskets for flange joints, soldering coppers, and copper nails and tacks. Their stock in Pittsburgh is the largest in the United States, shipments of stock sizes being made the day the order is received. They also carry large stocks in New York, Chicago and St. Louis, from which shipments can be made to nearby points.

Illinois Shippers Win An Important Case.

The Illinois Railroad and Warehouse Commission has rendered a decision in favor of L. I. Bregman & Co. vs. the Chicago & Northwestern Railway Company, for the collection of excess freight charges. The complainants, whose office is in the First National Bank Building, Chicago, billed a car of scrap iron from Evanston to Kewanee, routing it via the Chicago & Northwestern and the Chicago, Burlington & Quincy. Instead of giving the car to the Chicago, Burlington & Quincy at Chicago, which would be the cheapest way, the Chicago & Northwestern took it to Sterling and delivered it there to the Chicago, Burlington & Quincy for Kewanee, thus making a 45-cent higher rate than by the way of Chicago.

The shippers claimed that the railroad company should route shipments via the cheapest route possible where there is no specific routing given. The Chicago & Northwestern fought the case vigorously, and it was

pending with the Illinois Railroad Warehouse Commission for nearly two years. The credit for the outcome is due to the traffic department of L. I. Bregman & Co. in charge of Arthur M. Price and Joseph H. Turivas.

Patent Suit Over the Ilgner System As Applied to Rolling Mills.

A patent infringement case involving the Ilgner system for an improvement in the control of electrically-driven reversible rolling mills was tried recently in London. The action was brought by Donnersmarchütte Oberschlesische Eisen und Kohlenwerke Actien Gesellschaft against the Electric Construction Company, Ltd. The defendant had furnished the firm of Alfred Hickman, Ltd., with electric equipment for driving three large rolling mills. It was claimed that this infringed the Ilgner patents, though the defendants asserted that what they had introduced was simply the Ward-Leonard system of control and nothing more.

The plaintiff's attorney in presenting its case contended that the Ward-Leonard system of rheostatic control aimed at keeping the demand on the source of supply constant under varying load on the motor. For this purpose a primary motor and another generator were introduced. It was urged further that the Ward-Leonard system could never have been applied to reversible rolling mills without the modification involved in the Ilgner invention, and that there was no such application of it prior to Ilgner's patent of 1902. The first departure from the Ward-Leonard system was in not having a constant speed motor as the primary motor. Ward-Leonard, counsel said, had not appreciated that it was necessary to have the primary motor and the working motor equal in power. In order that the patentee, Ilgner, might achieve his purpose it was essential to have a working motor big enough to drive the rolling mills and take the maximum load. The patentee thought that if he had a primary motor whose speed would fall off as the load increased, and if he had a connection between and upon the same shaft as the primary motor, the generating armature and a heavy flywheel, he could take up the energy so that when the load came on the working motor and it tended to slow up, so would his primary motor, and then the stored-up energy in his heavy flywheel would supply the power needed to do the work in the working motor. The stored energy was brought into play because the primary motor was a motor whose speed diminished as the load increased. For starting or varying the speed the Ward-Leonard system of control was used. All that was required was a motor whose speed would fall off as the load increased so that the big flywheel would be no longer driven, but itself become a driver. The energy stored in the flywheel would supply the electric current necessary for the working motor. In order to reverse the working motor it was necessary simply to reverse the flow from the generator, which was done by an ordinary reversing switch.

By way of showing that no invention such as Ilgner's was needed to apply the Ward-Leonard system of control to rolling mills, the defense introduced several witnesses. One was S. Z. de Ferranti, who testified that in 1895 he took out a patent on flywheel storage when he was trying to improve the electric system of the City and South London Railway. His patent was exactly what is now in use at the Hickman Works. Judgment in the case was reserved.

Members of the Ohio Railroad Commission have sustained the contention of Ohio coal operators that the Wheeling & Lake Erie Railway rates for transporting coal from southeastern Ohio to Cleveland and Huron were excessive. The commission ordered the company to reduce its rate from 90 to 70 cents a ton within 30 days.

Shipbuilding and Shipping in Japan.

Their Rapid Upbuilding Under Subsidy Legislation.

BY T. GOOD.

The conditions and prospects of Japan's shipping and shipbuilding trades are well worth attention just now. These industries have already made considerable progress under the subsidies law of 1896, and under the revised system of subsidies, which became operative January 1, they promise to attain a still higher status.

The first shipbuilding yard of any modern importance in Japan was established at Nagasaki Harbor in 1857 by the government. Shortly afterward two or three shipyards and engine shops were started by private capitalists. In 1868 the construction of merchant vessels was undertaken at the Imperial yard. During the seventies another Imperial shipyard was established at Kobe, the best of the private concerns were nationalized, and several builders of small native boats had their yards fitted out for the construction of vessels of a more modern type. But the progress made was by no means substantial until the nineties. As late as 1894 out of 84 steamers of more than 1000 tons owned in Japan only one had been built at home.

Results of the Subsidies Act of 1896.

In 1896, however, the Shipping and Shipbuilding Subsidies Act was passed, operative in the following year, and this gave Japanese shipbuilding and ship owning their first real impetus. In the last year before the subsidies law came into force, 1896, less than 6000 tons of new merchant shipping was launched in the whole of Japan. Since then the following merchant tonnage has been built at home and added to the register, and the following sums have been paid by the state in subsidies on account of shipbuilding and navigation combined:

	New tonnage.			Subsidies.
	Steam.	Sail.	Total.	Yen.*
1896.....	5,860	1,061	5,921	.....
1897.....	10,693	2,472	13,165	1,944,000
1898.....	13,929	20,836	34,765	2,226,000
1899.....	18,157	20,342	38,499	5,742,000
1900.....	15,380	17,873	32,353	6,270,000
1901.....	31,829	20,255	52,084	7,620,000
1902.....	16,328	13,035	29,363	7,657,000
1903.....	33,612	9,925	43,537	7,951,000
1904.....	23,264	11,633	34,897	2,720,000
1905.....	33,039	16,457	49,496	3,040,000
1906.....	32,300	25,633	58,933	6,956,000
1907.....	70,870	3,782	74,652	9,997,000
1908.....	73,267	5,231	78,498	13,166,000
1909 (estimate)....	50,000	5,000	55,000	12,790,000

* A yen slightly exceeds half a dollar.

The New Subsidies Act.

The subsidies act of 1896 does not come to an end until September 30, 1914, so that ships enjoying the benefits of the existing scale of subsidies will continue to do so until that date, regardless of the new act. Under the new law shipbuilding will be encouraged both by direct subsidies and by the navigation subsidies paid for ships built at home. It would seem that under this new act shipping as such will receive somewhat smaller benefits than under the old one, while shipbuilding will enjoy more liberal terms, at any rate, as regards the larger vessels. Shipbuilders will receive bounties of from 11 yen to 22 yen per ton of gross measurement upon all steel ships of not less than 1000 tons gross, with an additional bounty upon the engines of 5 yen per indicated horsepower.

The new law aims at the maintenance of certain specified trade routes on the one hand and the encouragement of a speedier and larger type of vessel on the other. No navigation subsidies will be paid to ships of less than 3000 tons gross or less than 12 knots speed. An age limit is also fixed. Ships built of steel in

Japan and owned in Japan, of not less than 3000 tons, 12 knots per hour speed, and not more than five years old, are to be subsidized at a rate not exceeding 50 sen—that is, half a yen, or about 25 cents—per ton per 1000 nautical miles run. For every knot of speed above 12 per hour there is to be a bonus of 10 per cent. upon the base bounty. On the other hand, when a ship exceeds five years of age there will be a 5 per cent. reduction for every year until she is 15 years old, when the subsidy will be withdrawn. Besides this, the Minister of Communications is empowered to make reductions in the bounties paid to vessels which he considers are being operated upon undesirable routes or in trades which are so profitable that the full bounties may not be necessary. Also he may grant increased rates of bounty up to 25 per cent. upon the basis to ship owners who will run their vessels upon trade services which may not be profitable, but which are specially desirable for commercial or Imperial reasons. The stipulations introduce an element of uncertainty which is resented by Japanese ship owners, but the objects of the law cannot be mistaken.

And there is another provision worth notice. The Minister is empowered to grant the subsidies to foreign built ships if he thinks fit to the extent of not more than half the amount paid to home built vessels.

Lines Maintained Under Subsidy.

According to a Government paper recently issued it is anticipated that the following regular lines will be maintained and earn the subsidies authorized by the new ocean service subvention act:

European Route—Eleven ships of 6000 tons to 9000 tons gross; speed, 14 to 16 knots; sailings, fortnightly.

North American Route (Seattle)—Three ships of 6000 to 6500 tons; speed, 13 to 14 knots; sailings, every four weeks.

North American Route (Tacoma)—Six ships of 6000 to 6500 tons; speed, 13 to 14 knots; sailings, fortnightly.

North American Route (San Francisco)—Three ships of 13,000 to 14,000 tons; speed, 18 to 20 knots; sailings, every four weeks.

South American Route—Three ships of 5000 to 9000 tons; speed, 12 to 17 knots; sailings, fortnightly.

Australian Route—Three ships of 3500 to 6000 tons; speed, 15 to 17 knots; sailings, every four weeks.

Not only is the Japanese ship owner likely to become a serious competitor with British and German interests, but unless the United States merchant marine can be resuscitated the Japanese will monopolize the Pacific. Japanese statesmen seem fully alive to the possibilities of the Panama Canal.

The Nagasaki Shipyard.

The rapidly increasing commercial importance of the Far East, the prospective opening of the Panama Canal, the growth of South American trade, the renewal of the ship subsidy policy by the Japanese Government, the projected increase of the Japanese navy, and the cheapening of iron and steel production in Japan all combine to render the shipbuilding industry of that country a promising enterprise. Therefore a brief account of her shipyards may prove interesting.

The largest shipbuilding establishment in Japan is the one at Nagasaki, founded, as already mentioned, by the government in 1857. In 1884 this yard was sold to Baron Iwasaki, its present principal owner, and is now known as the Mitsu Bishi Works. This concern consists of engine shops at Akunoura and a patent slip at Kosuge, besides the original and now famous yard at Tateyami, Nagasaki. When the undertaking was sold by the Imperial authorities 800 men were employed. To-day 8500 are employed. It was not until 1898 that the first 6000-ton ship was launched—the Hitachi Maru, for the Nippon Yusen Kwaisha (Japan Mail Steamship Company). The construction of this vessel, coupled with the ship subsidy law, of which

she was really the first important product, marked the beginning of a new era in Japanese shipbuilding. Improvements and extensions followed rapidly, and the Mitsu Bishi is now one of the best equipped establishments in the world. The yard has nearly a mile and a half of water frontage; three dry docks 350, 510 and 750 ft. in length; a patent slip 750 ft. long, and seven building berths, ranging from 185 to 700 ft. long. Nearly all the machine tools are driven by electricity. There are shop, yard and wharf cranes of the latest pattern; electric hammers up to 150 tons striking force, and other up-to-date appliances, besides an excellent technical school at the works.

In the last three years this concern has launched seven turbine steamships of more than 8000 tons, besides smaller vessels; and there are now on the stocks a large turbine ship and three 6000-ton cargo boats. Two of the turbine steamers launched by the Mitsu Bishi recently—the Tenyo Maru and the Chiyo Maru, each of 13,500 tons—merit special mention. These vessels attained over 20 knots on trial, and they are fitted out in the most lavish style known to Japanese art. Rich silk hangings and embroidery are to be found all over the passenger quarters. On each vessel there are four suites of family rooms, 81 staterooms for 260 first-class passengers and well-appointed quarters for 47 intermediate and 1000 steerage passengers. These vessels, which are on the trans-Pacific service of the Toyo Kisen Kwaisha (Oriental Steamship Company), are equal in design and equipment to anything on the Atlantic.

The Kobe Shipyards.

The Mitsu Bishi Company has also opened a new yard at Kobe, and built a 12,000-ton floating dock there. The dock is made entirely of Japanese steel. Besides repair work the building of yachts and other small craft is being undertaken at the yard. All the Mitsu Bishi Works, it may be mentioned, are now managed by Japanese engineers, only three English engineers of subordinate rank and a diver being employed.

The second largest shipyard in Japan is at Kobe, and owned by the Kawasaki Dockyard Company, which, in addition to this yard and the adjoining engine works, has a steel foundry at Hiogo, where first rate castings are turned out. Like the yard at Nagasaki, this one was founded by the government and afterward (1886) sold into private hands, passing to the present ownership in 1896. The establishment is now four times as large as when the state parted with it. Until quite recently only torpedo craft and small gunboats for the Japanese and Chinese governments and medium sized merchant vessels were built here; but in the last two years four vessels of 6000 tons and two of 8600 tons have been launched, and accommodation has been provided for the building of ships up to 10,000 tons at least. There are four building berths of from 400 to 600 ft. in length, besides several others for smaller craft, the water frontage extending nearly a mile. There is a dry dock 377 ft. long and a huge floating dock is being constructed. Among the work on hand this firm has a 5000-ton protected cruiser and a submarine boat on the stocks.

An Important Yard Owned in England.

Third in importance among private shipbuilding establishments in Japan is the Osaka Iron Works, founded by an Englishman, T. H. Hunter, in 1880, and still owned by him. This concern now comprises a building yard covering 16 acres at Sakurajima, Osaka, engine shops at Ajikawa Guchi, and repairing works at Tempasan. The building yard has a water frontage of 1000 ft., and there are three dry docks. Most of the work undertaken here is the building of trawlers, dredgers, whalers, tugs, icebreakers and yachts. A few vessels of 500 to 1000 tons have been built, and one of 1800 tons, but nothing larger, as the river is only shallow at this point.

Altogether, there are 216 private shipyards in Japan, with 72 dry docks; but as yet only five of them

have launched more than 1000 tons of new shipping in a year. Most of them are engaged in building schooners, barges and fishing boats. Last year 37 deep sea fishing vessels were launched, 18 of which were motor boats. Fishing is subsidized under the Deep Sea Fishing Encouragement Act passed in 1896.

Imperial Shipyards.

Besides these private establishments, there are four Imperial dockyards in Japan. The Kure and Yokosuka yards have each accommodation for the building of two large battleships or armored cruisers at a time, while smaller war vessels are constructed at Sasebo and Maizuru. In the last three years the following ships of war have been built in these Imperial yards:

	Tons.	I. Hp.
Aki, turbine battleship.....	19,800	24,000
Ibuki, turbine cruiser.....	14,600	27,000
Kurama, turbine cruiser.....	14,600	22,500
Tone, cruiser.....	4,100	15,000
Uranami, torpedo boat destroyer.....	380	0,000
Shiktnami, torpedo boat destroyer.....	380	6,000
Ayanami, torpedo boat destroyer.....	380	6,000

Two large battleships are now on the stocks at Kure and Yokosuka, and two protected cruisers are being built in private yards—one at Nagasaki and the other at Kobe.

The Japanese engineers claim that they can now complete a first-class battleship in just about two years, so far as hull, engines and armor are concerned, but admit that the provision of gun equipment would take longer if home materials were relied upon entirely. Both the Kure and Yokosuka dockyards are furnished with every appliance necessary for the rapid handling of materials. At the former place is the Imperial arsenal, with its big gun and armor plate shops. Big guns, as well as small arms, are also made at the Imperial Steel Works at Wakamatsu, which are equipped with blast furnaces, converters, open hearth furnaces, rolling mills, &c., and where 7000 men are employed. At the Sasebo dockyard three new dry docks, 475, 600 and 750 ft. in length, are just about approaching completion. In design, workmanship and finish, Japanese shipbuilding has already attained a high status.

SHEFFIELD, ENGLAND.

Water Softening.

At the convention of the Indiana Sanitary and Water Supply Association, recently held at Indianapolis, Dr. Edward Bartow, director of the State Water Survey of Illinois, read one of the principal papers, his subject being "Water Softening for Municipal Supply." The first plant of the kind, he said, was established at Oberlin, Ohio, in 1903, and there are still only a few in the United States. In Illinois, where 76 water plants get their supplies from streams, lakes or ponds, there are only 18 softening plants, and the water from these sources needs softening more than that from deep wells. But the water softening idea is growing, he added. The Santa Fé Railroad has 97 softening plants along its lines, and the average cost of softening the water used for the locomotives is \$20 per 1,000,000 gal. He gave figures showing that the cost of softening the water supplies of Indiana cities is from \$6.60 to \$20.60 per 1,000,000 gal., and as an example of the profit of it, said that the White River water at Indianapolis could be softened at a cost of \$11.10 per 1,000,000 gal., while it would then be worth \$30 more per 1,000,000 gal. than unsoftened water, saving many a steam boiler used for heating or power, also much soap in the domestic service.

Dr. W. D. Weis, health officer at Hammond, Ind., told of the softening plant at McKeesport, Pa., which city gets its supply from the Youghiogheny River, "about as dirty a river as flows." He said the softening process was perfect in its results, the water when filtered being as clear and sparkling as that of any other river.

PERSONAL.

William L. Bigelow has taken charge of the Pittsburgh and Cleveland offices of the Murphy Iron Works, Detroit, Mich., succeeding A. H. Chas. Dalley, resigned.

David Stuart, for four years with the Riter-Conley Mfg. Company and previously with the Pittsburgh Valve, Foundry & Construction Company, Pittsburgh, is now connected with Edgar M. Moore & Co., dealers in iron and steel products, machinery and equipment, 914 Farmers' Bank Building, Pittsburgh, in the capacity of outside representative.

H. W. Schulze, formerly salesman for the Railway Materials Company, Chicago, is now representing as salesman the Calumet Engineering Works, Harvey, Ill.

William F. Morris, formerly with the Pittsburgh agency of the Great Northern Railroad and recently transferred to Buffalo, N. Y., has resigned, and in a short time will become general freight agent of the Crucible Steel Company of America, Frick Building, Pittsburgh, Pa. He succeeds A. L. Ralston, who has been transferred to the sales department of the company in an executive capacity.

John H. Way, purchasing agent for the Waterbury Clock Company, Waterbury, Conn., with which he has been connected for 28 years, has resigned, and will make his residence in Denver, Colo.

W. A. Ten Winkle, publicity manager of the Electric Controller & Mfg. Company, Cleveland, Ohio, has resigned to become affiliated with the Penton Publishing Company, Cleveland, as special representative.

Henry R. Towne, president Yale & Towne Mfg. Company, New York, has been re-elected president of the Merchants' Association of New York. Walter C. Kerr, president Westinghouse, Church, Kerr & Co., has been elected third vice-president.

L. W. Francis, secretary of Witherbee, Sherman & Co., Inc., New York, has gone to Cuba.

Archibald Johnston, first vice-president of the Bethlehem Steel Company, South Bethlehem, Pa., has returned from Europe.

C. F. Rand, president of the Spanish-American Iron Company, is in Cuba.

Ephraim Smith, who has been the New England sales manager of the Colonial Steel Company since its organization in 1901, has resigned his position on account of ill health. His successor is E. P. Fitzgerald, who has represented the Boston office, with headquarters in Springfield, Mass., for the past five years, the appointment taking effect March 1. The Boston office is located at 84 High street.

OBITUARY.

JOHN C. PORTER, Pittsburgh, died February 17, aged 79 years. His connection with the iron trade began in 1862 as a member of the firm of McKnight, Duncan & Co., afterward McKnight, Porter & Co., manufacturing bar iron, bands and hoops. In 1880 he assisted in establishing the Spang Steel & Iron Company, of which he was secretary and treasurer until 10 years ago, when he retired from active business life. He leaves a daughter.

JOSEPH GREENSPON, for 30 years connected with the pipe and iron business in St. Louis, Mo., and head of the firm of Joseph Greenspon & Sons and the Greenspon & Sons Pipe & Supply Company, died February 25, aged 47 years.

The Pennsylvania Boiler Works, Erie, Pa., has established a sales office at 712 Machesney Building, Pittsburgh, in charge of R. W. Oswald, who formerly handled the line of boilers made by the Atlas Engine

Works, Indianapolis, Ind. Mr. Oswald will retain the agency for the Atlas Engine Works engines as before.

Cementation Steel Castings.

Recent literature of the Chester Steel Castings Company, Chester, Pa., deals with cementation steel castings. Reference is made to this cementation steel as "a high carbon tool steel with no other alloy, in which the sulphur runs considerably higher than in ordinary tool steel and the manganese lower." The carbon in cementation steel is between 3 and 4 per cent. In its fully annealed state this product, it is said, machines almost as readily as cast iron. "It is also has the peculiar property of being able to be heat treated the same as any high carbon tool steel and air hardened. It cannot be hardened in water or oil because that would check-crack it." It is used for cast gears, blank gears, connecting rods, crank shafts and roll shells.

The elastic limit of this steel is high, being about twice that of ordinary forging steel. The elastic limit is about 60,000 lb. per square inch, and ultimate strength has run as high as 80,000 lb., while the reduction of area and elongation are from 5 to 8 per cent. This steel is so dense that its structure is not resolved by the microscope with magnification of 1200 to 1600 diameters, while open hearth, crucible and Bessemer steels are resolved at 100 diameters magnification or less. A long heat treatment is a part of the process of manufacture, six to eight weeks being required for the foundry operations and the full annealing following. Considerably less time is needed in the case of the specially hard steel.

New Officers of Iron & Steel Products Company.

The Iron & Steel Products Company, which was formed in 1909 by the merger of several iron rolling mill companies in the East, in a circular of March 1 announces that at the last annual meeting of the company the following officers and directors were elected: Jacob M. Shenk, Lebanon, Pa., president; John C. Brown, Baltimore, Md., vice-president; John J. Caine, Philadelphia, Pa., treasurer; C. M. Foster, secretary and assistant treasurer; Eli Attwood, H. J. Shenk, E. R. Chapman, C. Shenk, John Bauernschmidt, Thomas Evans and Paul B. Scarff. The office of the company has been removed to 224-225 Real Estate Trust Building, Philadelphia. Referring to the new officers and to the company's finances, the circular says: "No persons other than the above have power to represent the company, and all persons hitherto connected with the company in an official capacity have ceased their connection therewith. This puts the management of the property in the hands of the original owners of the constituent companies. The company is being placed on a sound financial basis. The books were found to be in some confusion and are being audited by the New York & Buffalo Audit Company. As soon as this audit is completed the new management will adjust all matters outstanding."

The Westinghouse Electric Wins a Patent Suit.

The Westinghouse Electric & Mfg. Company has won an important decision in a patent case which was brought in the United States Circuit Court of Appeals at Philadelphia against the Allis-Chalmers Company. The patent involved in this suit is No. 606,015, issued June 21, 1898, on the invention of B. G. Lamme, chief engineer, and relates to means for the prevention of racing by inverted rotaries. Such a machine, converting direct into alternating current, tends to speed-up rapidly under inductive load due to armature reaction and field weakening. The Lamme patent automatically compensates for this weakening of the field. The Court of Appeals holds the patent valid.

Customs Decisions.

Buck Saw Blades.

In sustaining a claim filed by the American Express Company, the Board of United States General Appraisers holds that buck saw blades are not to be regarded as "cross-cut" saws, but are to be classified at a lower rate. The blades were assessed for duty at 6 cents per linear foot under the provision in the tariff for "cross-cut" blades. The articles were claimed to be dutiable at 30 per cent. under the provision for "all other saws not specially provided for." The record in the case discloses that the blades here in question are known in trade and commerce as champion or tuttle tooth buck saws. General Appraiser Fischer in his decision for the board says in part:

That a distinction is made between saws which are adapted to use as cross-cut saws and such as are available for use as buck saws is evident. The cross-cut variety of saws is adapted for cutting timber across the grain, and is used in cutting down trees and cutting lumber. It is a heavier and larger saw than the buck saw and ranges in length from 4 to 10 ft.

The ordinary buck saw is a kind of a frame saw adapted to a nearly vertical motion and used in cutting kindling and firewood. We find that the saw blades in question are for the latter use. They are $2\frac{1}{2}$ ft. in length and $2\frac{1}{4}$ in. wide, and we hold that it was error to classify the merchandise under the provision for cross-cut saws. The claim in the protests at 30 per cent. ad valorem as "all other saws not specially provided for" is sustained.

Steel Rail Production in 1909.

The statistics just published by the American Iron and Steel Association show that the production of all kinds of rails in the United States in 1909 amounted to 3,062,582 gross tons, against 1,921,611 tons in 1908, an increase of 1,140,971 tons, or over 59.3 per cent. The production in 1907 was 3,633,654 tons. Rails rolled from purchased blooms, crop ends, scrap and "seconds," and rerolled and renewed rails are included. Renewed rails are rails that have been in use and after reheating are rolled down to smaller sections. In the following table the production of all kinds of rails in the past 10 years is given in gross tons. The maximum production was reached in 1906:

	Bessemer.	Open hearth.	Iron.	Total.
Pennsylvania	553,780	301,988	....	855,768
Other States	1,252,841	953,973	....	2,206,814
Totals for 1909	1,806,621	1,255,961	....	3,062,582
Totals for 1908	1,354,236	567,304	71	1,921,611
Totals for 1907	3,380,025	252,704	925	3,633,654
Totals for 1906	3,791,450	186,413	15	3,977,887
Totals for 1905	3,192,347	183,264	318	3,375,929
Totals for 1904	2,137,957	145,883	871	2,284,711
Totals for 1903	2,946,756	45,054	667	2,992,477
Totals for 1902	2,935,392	6,029	6,512	2,947,933
Totals for 1901	2,870,816	2,003	1,730	2,874,639
Totals for 1900	2,383,654	1,333	695	2,385,682

Of the total production of rails in 1909 2,884,133 tons was rolled from ingots made by the makers and 178,499 tons from purchased ingots or blooms, crop ends, "seconds" or renewed or rerolled rails.

Bessemer and Open Hearth Rails.

The production of Bessemer steel rails in 1909 amounted to 1,806,621 tons, against 1,354,236 tons in 1908, an increase of 452,385 tons, or over 33.4 per cent. Of the total in 1909 1,723,964 tons was rolled by makers of domestic ingots and 82,657 tons by companies which did not operate Bessemer converters. Included in the total by makers of domestic ingots is about 62,000 tons of rerolled rails. The following table gives the production by States from 1906 to 1909:

	1906.	1907.	1908.	1909.
Pennsylvania	1,298,409	1,093,932	315,563	553,780
Other States	2,493,050	2,286,093	1,038,673	1,252,841
Totals	3,791,450	3,380,025	1,354,236	1,806,621

The production of open hearth steel rails in 1909 was 1,255,961 tons, against 567,304 tons in 1908. The

increase in 1909 over 1908 was 688,657 tons, or more than 121 per cent., while the increase in 1908 over 1907 was 314,600 tons, or over 124 per cent. Almost all the open hearth rails in 1909 were rolled from basic steel, and virtually all were rolled by producers of open hearth ingots. The maximum production was reached in 1909. Indiana was the largest maker of open hearth rails in 1909, followed by Pennsylvania, Colorado, Alabama, Ohio, New York, Illinois, Maryland and New Jersey in the order named. In previous years Alabama had always been the leading producer.

Iron rails were not rolled in 1909. In 1908 the production was 71 tons.

Light Rails and Heavy Sections.

The following table gives the production of all kinds of rails in 1909 according to the weight of the rails per yard. Street and trolley rails are included.

The production of rails weighing under 45 lb. to the yard shows an increase of 71,989 tons in 1909 as compared with 1908; rails weighing 45 lb. and less than 85 lb. an increase of 352,986 tons, and rails weighing 85 lb. and over an increase of 715,996 tons.

Kind of rails.	Under Gross tons.	and less 45 lb.	than 85.	85 lb. and over.	Total. Gross tons.
Bessemer rails	223,568	735,500	847,553	1,806,621	
Open hearth rails	32,290	305,684	917,987	1,255,961	
Totals for 1909	255,858	1,041,184	1,765,540	3,062,582	
Totals for 1908	183,860	688,198	1,049,544	1,921,611	
Totals for 1907	205,838	1,569,985	1,767,831	3,633,654	
Totals for 1906	284,612	1,749,650	1,943,625	3,977,887	
Totals for 1905	228,252	1,601,624	1,546,053	3,375,929	
Totals for 1904	291,883	1,320,677	672,151	2,284,711	
Totals for 1903	221,262	1,603,088	1,168,127	2,992,477	
Totals for 1902	261,887	2,040,884	645,162	2,947,933	
Totals for 1901	155,406	2,225,411	493,822	2,874,639	
Totals for 1900	157,531	1,626,093	602,058	2,385,682	

Included in the 3,062,582 tons of steel rails rolled in 1909 is 50,505 tons of alloy steel rails, as follows: Titanium rails, 35,945 tons; manganese rails, 1,028 tons; nickel chrome rails, 12,287 tons, and nickel steel and electric steel rails, 1,245 tons. The 50,505 tons of alloy steel rails produced in 1909 was rolled by eight works in six States. Of the total 36,809 tons was rolled from alloy Bessemer steel and 13,696 tons from alloy open hearth steel.

The Whitaker-Glessner Interests.

On account of the death of N. E. Whitaker, president of the Whitaker-Glessner Company, with plants at Wheeling, W. Va., and Martins Ferry, Ohio, a reorganization of the Whitaker-Glessner Company, Wheeling Corrugating Company and Portsmouth Steel Company, all identified interests, has been made, the officers now being as follows:

Whitaker-Glessner Company: President, Alexander Glass; vice-president, W. L. Glessner; treasurer, A. C. Whitaker; secretary, A. T. Sweeney; general manager, N. P. Whitaker.

Wheeling Corrugating Company: President, A. C. Whitaker; vice-president, H. C. Whitaker; treasurer, W. H. Manning; secretary, Alexander Glass; assistant secretary, W. H. Abbott; general manager, N. P. Whitaker.

Portsmouth Steel Company: President, Alexander Glass; vice-president, A. C. Whitaker; secretary and treasurer, T. H. Jones; general manager, Andrew Glass.

The Lawrence Iron Company is the name of the organization which will make and market the iron manufactured at its furnace north of Ironton, Ohio, on the Detroit, Toledo & Ironton Railroad. The product is to be a high grade basic, and the company expects to be shipping iron by July 1. The furnace has been inactive for about two years. It will be entirely remodeled and fitted with new machinery, &c.

Canada May End Its Steel Bounties.

TORONTO, February 26, 1910.—In the Canadian House of Commons on Wednesday the member for West Algoma asked if it was the Government's purpose to renew the bounties on iron and steel. Mr. Fielding, the Financial Minister, replied that the Government had no present intention of renewing them. Beyond this statement he declined to go. It is regarded as significant that the Finance Minister is far from categorical in his reply. To say that the Government has no present intention of introducing legislation providing for a renewal of the bounties is not the same thing as to declare the Government's fixed purpose not to introduce such legislation. The minister has left a loophole out of which he may make exit if the pressure of petitions and the sense of Parliament seem sufficient to warrant the extending of the bounty law another five-year period.

Representatives of the iron and steel manufacturing interests have lately been in communication with the Government on the question. It is pointed out that the present year is an unfavorable one for terminating the bounties. Competition on the part of the United States steel makers is keener than ever in Canada, especially in the western part of the country. It is also keener on the part of Great Britain. In the last calendar year Canada's imports of British iron and steel and manufactures thereof were valued at \$7,660,000, as compared with like imports from Britain valued at about two-thirds of that sum in 1908. The removal of the surtax on imports from Germany reopens steel competition from that quarter. It is confidently predicted that traveling salesmen from Germany will soon be numerous and aggressive in the Canadian market. It is expected that their activity will give a new impulse to the competition of both British and United States traders. It is to be borne in mind, too, that the present arrangement with Germany is regarded as a provisional one, being the preliminary to negotiations for a commercial treaty of much the same type as that recently concluded between Canada and France. Canadian steel manufacturers have also to be prepared for the possibility of concessions being made to the United States in return for the benefits of the latter's minimum tariff. Further, the steel making companies of Nova Scotia have now to pay a royalty of $7\frac{1}{2}$ cents a ton on the iron ore they bring from their mines on Bell Island. Add to these things the fact that certain of the companies are being brought together in a merger, and it will appear that the circumstances are not quite as they ordinarily are in the steel trade of Canada. Whether or not the Government will regard any of these circumstances as grounds for continuing the bounties is a question. Assuredly, the members from the agricultural constituencies will oppose the giving of another lease of life to the bounties.

The bounties have become quite attenuated in this final year of the period. Pig iron draws 90 cents per ton on the proportion that is made from foreign ore. It is almost needless to say that the lower rate is the one paid on all, but a small part of the output as the ore used is mainly imported, some of it from the Lake Superior district of the United States and some from Bell Island in Newfoundland. The bounty rate on steel is 60 cents a ton, the condition being that 50 per cent. of its weight is the product of pig iron made in Canada.

C. A. C. J.

The February Bulletin of the West Virginia Board of Trade, Wheeling, W. Va., contains articles on the West Virginia Geological Survey, the West Virginia Shippers' Association, Dr. Charles W. Eliot's address on "The Complete Revolution in Business" before the Massachusetts State Board of Trade, together with short articles on the Federal corporation tax and special

developments in trade and business affairs in the State. This publication is issued monthly in the interest of the West Virginia Board of Trade and the progress and prosperity of the State. It is conducted with evident enterprise and should be influential in attracting the attention of outside interests to the advantages presented by West Virginia.

Heating and Ventilating Buildings.

The American Society of Heating and Ventilating Engineers, a national organization existing to promote the science of heating and ventilating buildings, has recently taken a broad and epoch making position in appointing a Committee of Publicity. This committee is made up of one member in each State, and its function is to work for the improvement of the public health by spreading the gospel of ventilation. The intention is to secure the publication of information and data pertaining to this subject; to co-operate with other organizations to improve living conditions; to furnish information regarding ventilation to boards of health or newspapers when desired, and in other ways, which may appear later, to educate the public to a realization of the benefits of proper air sanitation.

The American Society of Heating and Ventilating Engineers has about 350 members and holds two meetings each year. At these meetings papers are presented and discussions held for mutual advancement of knowledge. This society has through its efficient committee work been of great aid in securing compulsory ventilation laws in at least five States, and has caused the introduction of bills for compulsory ventilation in many more States. Its membership includes the designers of the heating and ventilating apparatus of nearly all of our largest and finest buildings, and the designers of the heating and ventilating apparatus of, perhaps, 90 per cent. of all of the schools in this country. The aid of the Publicity Committee is extended freely to all who may be endeavoring to secure proper ventilation of any buildings, and any one may get in touch with it by writing to the secretary of the society, W. M. Mackay, P. O. Box 1818, New York City.

Portsmouth Steel Company Improvements.

In connection with the offering of \$800,000 first mortgage 6 per cent. gold bonds of the Whitaker-Glessner Company, Wheeling, W. Va., due \$15,000 a year from 1914 to 1919, a circular says that \$150,000 is reserved to retire Laughlin Nail Company 6s. The object of the issue is to make the following improvements at Portsmouth, Ohio, where the company owns and operates the Portsmouth Steel Company: Tie plate mill, \$45,000; blooming mill, \$300,000; plate mill, \$25,000; open hearth mills, \$150,000; new jobbing mills, \$150,000; miscellaneous, \$105,000; total, \$775,000.

An opinion of Julian Kennedy, December 8, 1909, on the Whitaker-Glessner Company properties is quoted from as follows: "I have looked over the rolling mill properties at Wheeling, having 12 sheet mills, and auxiliary apparatus; the plant in Martins Ferry, comprising a six-mill plant for rolling sheets, and adjoining plant for producing finished wares from the sheet material. I have considered the value of about 225 acres of coal adjoining the plants. While I have not attempted a detailed estimate, I am satisfied that the valuation in your prospectus—namely, \$1,697,722—is very conservative. While some of the buildings at the Wheeling plant are not strictly modern, both plants are in good condition and well equipped to turn out a large product at a low manufacturing cost. In addition, the sheet mills have an assured market for a good percentage of their product, even in dull times, through their affiliation with the Wheeling Corrugating Company."

NEWS OF THE WORKS.

Iron and Steel.

The creditors of the Canadian Sheet Steel Corporation, whose works are at Morrisburg, Ontario, held a meeting February 18 at which they authorized the continuance of the operations of the company and the construction of power lines to provide sufficient power to run the business at full force. This business is now being carried on in an aggressive manner and those who are interested in the corporation hope to be able to effect a reorganization.

The Alice blast furnace, now operated by the Youngstown Sheet & Tube Company, at Sharpsville, Pa., has been blown out for relining and repairs. It will be put in blast again as soon as these are completed, and on July 1 the furnace will be transferred to the Thomas D. West Foundry Company, which bought this plant last year.

The Reading Iron Company, Reading, Pa., is arranging for the erection of a one-story iron forge building, 50 x 100 ft., to be operated in connection with its sheet mill.

The Parkersburg Iron & Steel Company, Parkersburg, W. Va., which makes a specialty of Parkersburg blue annealed sheets for the stove and range trade, is rebuilding that part of its plant destroyed by fire last November. The new buildings are on a larger scale than the ones burned down and will give the company a larger output and better facilities for handling its output. New users are steadily coming up for its products, which naturally cause a largely increased demand.

The Keystone Furnace Construction Company, Fulton Building, Pittsburgh, has received a contract from the La Belle Iron Works, Steubenville, Ohio, for equipping all its open hearth furnaces with the Knox patent copper door frame rims, which makes the fourth large plant to be fitted complete with this device, the others being Alan Wood Iron & Steel Company, Ivy Rock, Pa.; Harrisburg Pipe & Pipe Bending Company, Harrisburg, Pa., and Inland Steel Company, Indiana Harbor, Ind. The Keystone Company has equipped open hearth furnaces in various other steel mills with the device, and the indications are that the entire plants will be equipped throughout, as soon as the first installations have been thoroughly tried out.

The blast furnace of the Delaware River Steel Company, Chester, Pa., which was recently banked, owing to a fire which damaged the engines and engine house, has been restarted and will, it is expected, be producing regularly within the week.

Temporary repairs have been made to the blowing engines of the Northern Iron Company's furnace at Port Henry, N. Y., and the plant is again in operation.

General Machinery.

The Connellsville Iron Works, Connellsville, Pa., has completed a coke pusher and coal leveler for the new plant of the Pittsburgh-Westmoreland Coal Company, Bentleyville, Pa. The machines are reported as giving entire satisfaction. A contract was secured for a pusher, leveler, and conveyor for the Pittsburgh-Westmoreland Company, but owing to large orders previously in hand and the necessity of getting the machine in operation to save damage to the ovens in the winter weather the order for the conveyor was turned over to the Connellsville Machine & Car Company, the Connellsville Iron Works furnishing the plans and materials. The latter concern has just completed a large addition to its plant and is figuring on the building of several other machines to be used at coke ovens, plans for which it expects to have ready in a short time.

The Bellefonte Foundry & Machine Company, Bellefonte, Pa., is filling an order for two power hammers to be shipped to the Pierce-Arrow Motor Car Company, Buffalo, N. Y. The Bellefonte Company is successor to the J. Howard Lingle Company and is enjoying an excellent business, especially from the automobile manufacturers.

Foundries.

Contracts have been let for an addition to the new machine shop of the Ferro Machine & Foundry Company, Cleveland, Ohio, which will practically double its capacity. The addition consists of a brick and concrete building, 140 x 160 ft., with basement, and is to be completed by May 15. The main floor will be devoted principally to the machine shop, with a portion for the foundry shipping department. The basement will contain the cleaning department for the foundry. This addition, together with previous ones since July last, made at an aggregate cost of \$300,000, triples the capacity of this plant.

The Dayton Malleable Iron Company, Dayton, Ohio, is adding a foundry to its plant, which is expected to be in operation within 30 days. All necessary equipment has been purchased, but more may be needed later for further contemplated extensions.

The Velte Foundry & Machine Company, Pittsburgh, has started active work on its new plant to be built at Mars, Pa. The buildings to be erected are as follows: Gray iron foundry, 60 x 200 ft.; machine shop, 50 x 100 ft.; pattern shop, 50 x 100 ft.; power house, 50 x 75 ft., and office buildings. It is expected that the works will be in operation May 1. This company will be in the market for considerable equipment for this new plant.

The Indiana Brass & Iron Bed Company, Marion, Ind., has added to its foundry equipment two 5-ton Newton cupolas made by the Northern Engineering Works, Detroit, Mich.

The plant of the Vincennes Pipe & Casting Company, Vincennes, Ind., was sold at receiver's sale, Saturday, to Louis A. Meyer, Vincennes, for \$5000. The company failed last year.

The National Roll & Foundry Company, Pittsburgh, which heretofore has ordered from outside concerns the steel castings required in its contracts for rolling mill equipment, has decided to make its own steel castings, and will install in its plant at Avonmore, Pa., a 50-ton open hearth furnace. It will also build an 80-ft. addition to its machine shop, to be equipped with roll lathes of its own manufacture. It is busy in all departments.

The New Method Stove Company, Mansfield, Ohio, whose plant was recently destroyed by fire, has started work on a new factory. The power plant equipment has been purchased and orders for the necessary machinery will be placed at once. It is stated the plant will be in operation by April 1.

It is reported that the plant of the Federal Steel Casting Company, Chester, Pa., has been sold to the Wm. Cramp & Sons Ship & Engine Building Company, Philadelphia, Pa. While it is known that negotiations of this sale have been under way, those interested refuse to confirm or deny the sale.

Power Plant Equipment.

The Best Mfg. Company, Twenty-fifth street and Allegheny Valley Railway, Pittsburgh, has recently received important contracts from the following manufacturers: Youngstown Sheet & Tube Company, Youngstown, Ohio, complete high pressure piping equipment, including valves and fittings, for new blast furnace, to be ready for operation June 1; Indiana Steel Company, Gary, Ind., cast steel pipes from 30 to 42 in., with valves, fittings, &c., for steel stand pipe for central pumping station; United Coal Company, for Isabella-Connellsville Coal & Coke Company's new plant at East Millisboro, near Brownsville, Pa., including steam and exhaust piping, boiler feed and blow off lines, with fittings; Lake Shore & Michigan Southern Railroad Company's new power plant at Ashtabula, Ohio, where a high pressure piping installation for live steam and exhaust, feed water and blow off system is being erected. The Best Mfg. Company has other contracts covering the manufacture and installation of piping equipment insuring operations to nearly normal capacity for some time ahead.

Murray & Rogers, Farmers' Bank Building, Pittsburgh, have recently sold machinery and equipment in the Pittsburgh district as follows: Borough of Millvale, Pa., two Titusville boilers of 100 hp. each, two Ideal steam engines of 150 hp. each; Atlantic Refining Company, Pittsburgh, two 200-hp. boilers; H. C. Frick Coke Company, for installation in the Gates plant, two 200-hp. boilers, Mammoth plant, two 150-hp. boilers.

The Babcock & Wilcox Company, Farmers' Bank Building, Pittsburgh, has received an order from the Cleveland Electric Aluminum Company, Cleveland, Ohio, for the installation of 3000 additional horsepower Babcock & Wilcox water tube boilers.

B. M. Everson, German National Bank Building, Pittsburgh, Pa., recently made a shipment of a large reversing engine for blooming mill to the Nova Scotia Steel & Coal Company, Nova Scotia; a shipment of heavy rolling mill equipment to Seattle, Wash., and four large second-hand freight locomotives to a railway company on the Pacific Coast.

Bridges and Buildings.

The McKeesport Construction Company, McKeesport, Pa., will soon commence the erection of a steel building for the Pittsburgh Plate Glass Company at Kennerdell, Pa., which will require 270 tons of steel, and which was fabricated by the Pittsburgh Bridge & Iron Works, Rochester, Pa.

Fires.

On February 23 fire damaged the automobile factory of the Harder Automobile Company, Chicago, Ill., to the extent of \$50,000.

Fire caused a \$2000 damage to the Gardner Foundry Company, Lockport, N. Y., February 22.

The engine room and office of Richard De Cou, iron, steel and metal merchant, Twelfth and Noble streets, Philadelphia, Pa., were damaged by fire February 19. The fire did not seriously inconvenience the business, everything being in running order in a few days. The loss has not been fully estimated.

The plant of the New Milford Foundry & Machine Company, New Milford, Conn., was burned March 1. The estimated loss is \$20,000.

Miscellaneous.

The Hudson Motor Car Company, Detroit, Mich., has secured a site of 106 acres in the old Fairview district at a cost of \$140,000, and intends erecting at once a \$400,000 plant to manufacture automobiles. The buildings will be of reinforced concrete construction. Roy B. Chapin is president of the company. It is probable that a large factory for the Gray Motor Company will be constructed on part of the same site some time in the near future.

W. T. Carter, president and treasurer of the Meyercord-Carter Company, Parkersburg, W. Va., manufacturer of vitrolite milk white plates and tiling for structural use, has sold his

entire holdings in that company to Geo. R. Meyercord of Chicago, the vice-president. In the reorganization since effected Mr. Meyercord was elected president; Sydney R. Clarke of Rochester, N. Y., formerly vice-president of the Traders' National Bank of that city, was elected vice-president and treasurer, and D. S. Beebe, secretary and manager. Mr. Clarke is to assume the active management of the company. The products are sold through the following agencies: C. J. Govern, 7 East Forty-second street, New York City; P. H. Bernays, 718 Merchants' Trust Building, Los Angeles, Cal.; S. M. Gunsaul, 603 Exchange Building, Denver, Colo.; F. J. Downs, 1107 Chamber of Commerce Building, Chicago; Heidbrink-Fischer Mercantile Company, 815 Chestnut street, St. Louis; R. G. Pentecost, sales manager, 185 Watson boulevard, N. S., Pittsburgh, Pa.

The Hayden-Corbett Chain Company, Columbus, Ohio, lost one of its buildings by fire February 25. The plant is running and filling orders as usual. Rebuilding of the burned portion will be commenced immediately.

The Railway Brake Shoe Company has been organized at Washington, Pa., with an authorized capital of \$500,000, and proposes to engage in the manufacture of a patent shoe brake for railroads. The incorporators are J. L. Cohagan, G. O. De Vaughan and Eli Gray, all of Washington, Pa.

The Buffalo Extractor Corporation has been incorporated at Buffalo, N. Y., with a capital stock of \$50,000, and will act as mechanical and construction engineers for the building of garbage reduction plants. The company will also furnish a plant of its own, and will remodel and operate the Baynes Garbage Reduction works at William street and the Lehigh Valley Railroad. The offices of the company are at 563 William street. C. H. A. Wanenwesch is president.

The Hercules Waterproof Cement Company has been incorporated at Buffalo, N. Y., with \$100,000 capital stock, and will build or lease and equip a plant in Buffalo for the manufacture of waterproof cement. Charles F. Peters of the General Mercantile Company, J. Louis Seligman and W. H. F. Tenny are among the incorporators. The offices are at 1 Coal and Iron Exchange.

The Detroit Radiator Company, Detroit, Mich., has let contract for a one-story brick addition, 85 x 105 ft., to its plant on Jefferson avenue.

The Michigan Motor Car Company, Detroit, Mich., has purchased a manufacturing site and is having plans prepared for an extensive plant which it will erect this spring. H. M. Thomas, 353 Bagg street, is at the head of the new enterprise.

The Indiana Power Company has been organized at Indianapolis, Ind., and incorporated, with \$25,000 capital stock, as general manufacturers. The directors are C. L. Schmidt, F. W. West, J. M. Stuart, George E. Moore, W. Dickerson, Albert Thompson, D. A. Johnson, R. B. Spillman, J. R. Rauh.

The Overland Automobile Company, Indianapolis, Ind., will erect a fireproof building, with 10,000 sq. ft. of floor space, to be used mainly as additional facilities for grinding cam shafts. Will H. Brown, vice-president and manager, says the Overland Company will use this year 30,000 tires and thousands of tons of aluminum and other steel. Recent contracts were for 2200 tons of forging steel, 300 tons of cold rolled steel, 500,000 lb. of steel tubing and a three years' supply of malleable iron tubing.

The American Hoist & Derrick Company, Minneapolis, Minn., is enlarging its power plant by the addition of an Allis-Chalmers 1000-kw. 1800 rev. per min. 440-volt 60-cycle three-phase turbo unit, receiving steam at 175 lb. gauge and exhausting into a 28-in. vacuum.

The plant of the Automatic Tool Company, now in course of construction at Richmond, Ind., will be completed about April 1.

The Franklin Steel Company, Franklin, Pa., is putting on the market a steel pole for electric power transmission lines which is strong enough to save the cost of towers and makes a very effective substitute for wooden poles.

The name of the Evansville Brass & Iron Bed Mfg. Company, Evansville, Ind., has been changed to Evansville Metal Bed Company. The capital stock has been increased from \$60,000 to \$100,000.

The Ohio Coin Controlling Lock Company has been organized at Indianapolis, Ind., and incorporated, with \$10,000 capital stock, to manufacture a specialty. The directors are R. T. Mullis, J. L. Freeland and W. T. Sortwell.

The Globe Stove & Range Company, Kokomo, Ind., has increased its capital stock from \$100,000 to \$250,000. Richard Ruddell is president.

Johnson & Conklin of Greenfield, Ind., will erect a factory for the manufacture of cement tile.

The Frick Company, Waynesboro, Pa., has received during the past season over 30 orders for complete ice plants from its Southwestern manager, O. J. Morris, Dallas, Texas.

ber for Pictou, N. S., and a very prominent supporter of the Government, recently made a speech on the naval question, in which he stated that the Dominion Iron & Steel Company is prepared to undertake the manufacture of steel plates suitable for war ships. Nova Scotia, he said, has made a beginning in the construction of steel vessels. At the opening of the Nova Scotia Legislature, February 24, it was stated in the speech from the throne that the provincial Government looks forward to as great activity in the building of steel ships in Nova Scotia yards as there formerly was in the building of wooden vessels there. It was added that every effort should be put forth to insure the establishment in the province of yards to build the vessels of the Canadian navy. It was announced that the Government would bring this business before the Legislature in the present session.

Mining Engineers at Pittsburgh.

The opening session of the 98th meeting of the American Institute of Mining Engineers was held in Carnegie Lecture Hall, Pittsburgh, Tuesday evening, March 1. The address of welcome was made by Julian Kennedy, Pittsburgh; a biographical notice of the late Dr. Charles B. Dudley was presented by Dr. R. W. Raymond, New York, secretary of the Institute; a similar notice of the late William Metcalf by H. P. Bope, first vice-president Carnegie Steel Company, Pittsburgh, and a paper on the "Development of Hindered Settling Apparatus" by Robert H. Richards, Boston, Mass.

The programme for Wednesday morning included papers on "A Commercial Fuel Briquetting Plant," by William H. Blauvelt, Syracuse, N. Y.; "The Form of Coal Analysis Best Adapted for Comparative Purposes," by M. R. Campbell, Washington, D. C.; "Work of the Technologic Branch of the United States Geological Survey at Pittsburgh," by J. A. Holmes, Washington, D. C. For Wednesday afternoon arrangements were made for a series of tests at the government testing station at Pittsburgh, illustrating the work done by the Technologic Branch of the United States Geological Survey. These tests were designed to show the comparative effects of permissible explosives and of black powder upon coal dust and the effect of explosive mixtures of air and gas. The programme for Wednesday evening included a paper on "The Introduction of the Basic Steel Process in the United States," by George W. Maynard, New York. It was expected that Thursday would be given up to a visit to the Homestead Works of the Carnegie Steel Company, while a session on Friday morning was to be devoted to the reading and discussion of papers.

The Pittsburgh committee consists of the following: R. C. Crawford, chairman; H. W. Craver, secretary; Julian Kennedy, Taylor Allderdice, E. W. Pargny, C. L. Miller, W. H. Rea, S. A. Taylor, M. E. Wadsworth, W. M. Henderson, A. C. Dinkey, W. L. Jones, E. L. Messler, George Mesta, J. H. Jones, G. H. Riley, S. L. Goodale, D. W. McNaugher.

On May 1 the Dearborn Drug & Chemical Works will move its general offices and chemical laboratories from the Postal Telegraph Building, where they have been located since the organization of the company more than 20 years ago, to the new McCormick Building on Michigan avenue and Van Buren street. The extensive growth of the business of the company in the successful treatment of boiler feed waters has made necessary this removal to its new home, where the general offices and laboratories will occupy the greater portion of the top floor of one of the finest office buildings in Chicago, with a total floor space of more than 5000 sq. ft.

Nova Scotia's Shipbuilding Expectations.—In the Canadian House of Commons E. M. Macdonald, mem-

THE IRON AND METAL TRADES

Improvement Is in Sentiment.

Pig Iron Buying Has Been at the Expense of Prices.

The improvement in the iron trade, of which more has been heard in the past week, is still largely a sentimental one. Some of it is due, no doubt, to the coming on of the active outdoor season; but there is also the wearing off of the scare that has been so largely in control since the opening of the year. It cannot be said that the large steel interests are now booking more new business than was being taken a fortnight ago, but they see more in prospect. There has been some buying of pig iron, for the most part by large consumers, and the business has been of the sort that brings prices to new low levels.

In foundry iron one important buyer has taken about 9000 tons for Eastern plants, and is still in the market for 4000 to 5000 tons. Radiator concerns have been inquiring for about 15,000 tons, of which a small part was closed. A cast iron pipe company has bought about 20,000 tons of Southern iron, but this is really the renewal of a sliding scale contract, the deliveries extending over six months. An electrical company in the Middle West is asking for 15,000 tons for Cleveland and Pittsburgh district delivery. Other inquiries are being made for foundry iron for the second quarter and the second half. However, the general run of buyers are not convinced by the argument of higher ore prices for 1910, and are disposed to wait for indications which they do not find yet, that the point of greatest weakness has been passed.

The sales of the past week have brought down prices of Northern foundry iron about 5c. a ton, while Virginia No. 2 iron is now sold at \$15 at furnace and Alabama warrant iron at \$13, for early delivery. While some Southern furnaces are holding at \$14 and in some cases higher prices iron for delivery in the second half, others will sell for \$13.50 for delivery in the remainder of the year.

The level to which domestic iron has fallen and the rate of pig iron production in the United States point to the elimination of foreign foundry iron as a factor for many months. The total movement, beginning last fall, is estimated to have represented 40,000 tons of British iron.

There is little probability that the Steel Corporation will require additional Bessemer pig iron, though less than 91 per cent. of its blast furnace capacity is now active, against 96 per cent. early in the year. The latter percentage was abnormally high, due to a combination of favorable circumstances. In the past week three of the corporation's stacks were ordered out for repairs—at Youngstown, Ensley and New Castle.

Rail orders include 10,000 tons of Bessemer rails for an Alaska copper district railroad, and 10,000 tons of open hearth rails, booked at Chicago, for Eastern shipment. Orders for track supplies have increased notably in the past week.

Plate mills are making heavy shipments to car builders. Railroads are negotiating for additional cars. The Southern Railway inquiry includes definitely 3000 coal cars and 500 coke cars. Pipe work has brought a considerable tonnage to the plate mills recently.

Steel bars are still the strongest feature in finished lines, and some mills will be kept fully occupied beyond July 1 by business now in hand. In the Chicago district bar iron is weaker, in view of the decline in scrap.

The structural trade continues to show a good aggregate of relatively small orders. A new bank building at Chicago will require 7000 tons and the Cincin-

nati, Hamilton & Dayton has placed 3500 tons of bridge work.

The American Sheet & Tin Plate Company has 163 hot sheet mills in operation out of a total of 186 serviceable mills and 185 hot tin mills out of 235 serviceable mills. The overflow of tin plate orders from some of the larger interests that are booked ahead to September has made it possible for some of the smaller sellers to secure premiums for early delivery.

The movement among Connellsburg and Klondike coke operators to establish a selling agency is taking shape. Further slight reduction of coke output has been made. Two inquiries have come up for furnace coke for Eastern shipment at 15,000 and 6000 tons a month, respectively, over a period of six months. For coke carrying under 1 per cent. sulphur \$2.50 has been quoted for delivery through the year.

The recent buying of copper was not by larger interests, and the total was about 25,000,000 lb., for the most part at 13.37 $\frac{1}{2}$ c.

A Comparison of Prices.

Advances Over the Previous Month in Heavy Type, Declines in Italics.

At date, one week, one month and one year previous.

	Mar. 2, 1910.	Feb. 23, 1910.	Feb. 2, 1910.	Mar. 3, 1909.
PIG IRON , Per Gross Ton :				
Foundry No. 2, standard, Philadelphia	\$18.00	\$18.50	\$18.75	\$16.50
Foundry No. 2, Southern, Cincinnati	16.75	16.75	17.25	15.75
Foundry No. 2, local, Chicago	18.50	19.00	19.00	16.50
Basic, delivered, eastern Penn.	18.50	18.50	18.50	16.00
Basic, Valley furnace	16.00	16.00	16.50	15.00
Bessemer, Pittsburgh	18.90	18.90	19.00	16.40
Gray forge, Pittsburgh	16.15	16.90	17.15	14.90
Lake Superior charcoal, Chicago	19.50	19.50	19.50	19.50
BILLETS, &c. , Per Gross Ton :				
Bessemer billets, Pittsburgh	27.50	27.50	27.50	20.00
Forging billets, Pittsburgh	32.00	32.00	31.00	22.00
Open hearth billets, Philadelphia	30.60	30.60	30.60	...
Wire rods, Pittsburgh	33.00	33.00	33.00	33.00
Steel rails, heavy, at mill	28.00	28.00	28.00	28.00
OLD MATERIAL , Per Gross Ton :				
Steel rails, melting, Chicago	16.50	16.50	17.00	13.00
Steel rails, melting, Philadelphia	16.50	16.50	17.00	...
Iron rails, Chicago	19.00	19.00	20.00	17.75
Iron rails, Philadelphia	20.00	20.00	20.50	...
Car wheels, Chicago	17.00	17.50	18.00	14.75
Car wheels, Philadelphia	16.75	16.75	17.00	...
Heavy steel scrap, Pittsburgh	16.50	16.75	17.50	14.50
Heavy steel scrap, Chicago	15.00	15.25	16.00	12.50
Heavy steel scrap, Philadelphia	16.50	16.50	17.00	...
FINISHED IRON AND STEEL ,				
Per Pound :				
Refined iron bars, Philadelphia	1.60	1.60	1.65	1.42
Common iron bars, Chicago	1.55	1.60	1.60	1.40
Common iron bars, Pittsburgh	1.65	1.70	1.70	1.40
Steel bars, tidewater, New York	1.61	1.66	1.66	1.36
Steel bars, Pittsburgh	1.45	1.50	1.50	1.20
Tank plates, tidewater, New York	1.71	1.71	1.71	1.46
Tank plates, Pittsburgh	1.55	1.55	1.55	1.30
Beams, tidewater, New York	1.60	1.66	1.71	1.46
Beams, Pittsburgh	1.50	1.50	1.55	1.30
Angles, tidewater, New York	1.66	1.66	1.71	1.46
Angles, Pittsburgh	1.50	1.50	1.55	1.30
Skelp, grooved steel, Pittsburgh	1.50	1.50	1.50	...
Skelp, sheared steel, Pittsburgh	1.60	1.60	1.60	...
SHEETS, NAILS AND WIRE ,				
Per Pound :				
Sheets, black, No. 28, Pittsburgh	2.40	2.40	2.40	2.30
Wire nails, Pittsburgh	1.85	1.85	1.85	1.95
Cut nails, Pittsburgh	1.85	1.80	1.80	1.80
Barb wire, galv., Pittsburgh	2.15	2.15	2.15	2.40
METALS , Per Pound :				
Lake copper, New York	13.75	13.75	13.87 $\frac{1}{2}$	12.75
Electrolytic copper, New York	13.37 $\frac{1}{2}$	13.37 $\frac{1}{2}$	13.62 $\frac{1}{2}$	12.62 $\frac{1}{2}$
Spelter, New York	5.75	5.70	6.12 $\frac{1}{2}$	4.80
Spelter, St. Louis	5.60	5.55	5.90	4.62 $\frac{1}{2}$
Lead, New York	4.65	4.55	4.70	3.95
Lead, St. Louis	4.50	4.40	4.00	3.80
Tin, New York	32.87 $\frac{1}{2}$	33.20	32.60	28.62 $\frac{1}{2}$
Antimony, Hallett, New York	8.25	8.25	8.25	7.75
Nickel, New York	45.00	45.00	45.00	45.00
Tin plate, 100 lb., New York	\$3.84	\$3.84	\$3.84	\$3.80

* These prices are for largest lots to jobbers.

Prices of Finished Iron and Steel F.O.B. Pittsburgh.

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Paul, 32c.; St. Louis, 22½c.; New Orleans, 30c.; Birmingham, Ala., 45c. Rates to the Pacific Coast are 90c. on plates, structural shapes and sheets, No. 11 and heavier; 85c. on sheets, Nos. 12 to 16; 95c. on sheets, No. 16 and lighter; 65c. on wrought pipe and boiler tubes.

Structural Shapes.—I-beams and channels, 3 to 15 in., inclusive, 1.50c. to 1.55c., net; I-beams over 15 in., 1.65c., net; H-beams over 8 in., 1.75c.; angles, 3 to 6 in., inclusive, ½ in. and up, 1.60c., net; angles over 6 in., 1.65c., net; angles, 3 x 3 in. and up, less than ¼ in., 1.75c., base, half extras, steel bar card; tees, 3 in. and up, 1.65c., net; zees, 3 in. and up, 1.60c., net; angles, channels and tees, under 3 in., 1.50c., base, plus 10c., half extras, steel bar card; deck beams and bulb angles, 1.80c., net; hand rail tees, 2.80c., net; checkered and corrugated plates, 2.80c., net.

Plates.—Tank plates, ¾ in. thick, 6⅔ in. up to 100 in. wide, 1.55c. to 1.60c., base. Following are stipulations prescribed by manufacturers, with extras to be added to base price (per pound) of plates:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated February 6, 1903, or equivalent, ¼-in. thick and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per square foot, are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼-in. thick on edge, or not less than 11 lb. per square foot, to take base price. Plates over 72 in. wide ordered less than 11 lb. per square foot down to the weight of 3-16-in. take the price of 3-16-in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Gauges under ¼-in. to and including 3-16-in. on thinnest edge.....	\$0.10
Gauges under 3-16-in. to and including No. 8.....	.15
Gauges under No. 8 to and including No. 9.....	.25
Gauges under No. 9 to and including No. 10.....	.30
Gauges under No. 10 to and including No. 12.....	.40
Sketches (including all straight taper plates), 3 ft. and over in length.....	.10
Complete circles, 3 ft. diameter and over.....	.20
Boiler and flange steel.....	.10
"A. B. M. A." and ordinary firebox steel.....	.20
Still bottom steel.....	.30
Marine steel.....	.40
Locomotive firebox steel.....	.50
Widths over 100 in. up to 110 in., inclusive.....	.05
Widths over 110 in. up to 115 in., inclusive.....	.10
Widths over 115 in. up to 120 in., inclusive.....	.15
Widths over 120 in. up to 125 in., inclusive.....	.25
Widths over 125 in. up to 130 in., inclusive.....	.50
Widths over 130 in.....	1.00
Cutting to lengths or diameters under 3 ft. to 2 ft., inclusive.....	.25
Cutting to lengths or diameters under 2 ft. to 1 ft., inclusive.....	.50
Cutting to lengths or diameters under 1 ft.....	1.55
No charge for cutting rectangular plates to lengths 3 ft. and over.	

TERMS.—Net cash 30 days.

Sheets.—Minimum prices for mill shipments on sheets in carload and larger lots, on which jobbers charge the usual advances for small lots from store, are as follows: Black annealed sheets, Nos. 3 to 8, 1.70c.; Nos. 9 and 10, 1.75c.; Nos. 11 and 12, 1.80c.; Nos. 13 and 14, 1.85c.; Nos. 15 and 16, 1.95c. Box annealed sheets, Nos. 17 to 21, 2.20c.; Nos. 22 to 24, 2.25c.; Nos. 25 and 26, 2.30c.; Nos. 27, 2.35c.; Nos. 28, 2.40c.; Nos. 29, 2.45c.; Nos. 30, 2.55c. Galvanized sheets, Nos. 13 and 14, 2.50c.; Nos. 15 and 16, 2.60c.; Nos. 17 to 21, 2.75c.; Nos. 22 to 24, 2.90c.; Nos. 25 and 26, 3.10c.; Nos. 27, 3.30c.; Nos. 28, 3.50c.; Nos. 29, 3.60c.; Nos. 30, 3.85c. Painted roofing sheets, No. 28, \$1.70 per square. Galvanized roofing sheets, No. 28, \$3 per square, for 2½-in. corrugations.

Wrought Pipe.—The following are the discounts on the Pittsburgh basing card on carloads of wrought pipe which went into effect January 1:

	Steel.	Iron.
	Black. Galv.	Black. Galv.
½ and ¼ in.....	70 54 65	..
¾ in.....	71 57 66	52
½ in.....	74 62 69	57
¾ to 6 in.....	78 68 73	63
7 to 12 in.....	72 57 67	52
Plugged and Reamed,		
1 to 4 in.....	76 66 71	61
Extra Strong, Plain Ends.....	63 51 58	46
½ to ¾ in.....	70 58 65	53
½ to 4 in.....	66 54 61	49
4½ to 8 in.....	54 42 ..	..
9, 10, 11 and 12 in.....	54 42 ..	..
Double Extra Strong, Plain Ends,		
½ to 8 in.....	59 48 54	43

The above steel pipe discounts are for "card weight," subject to the usual variation of 5 per cent.

Boiler Tubes.—Discounts on lap welded steel and charcoal iron boiler tubes to jobbers in carloads are as follows:

	Steel.	Iron.
1 to 1½ in.....	49 43	
1½ to 2¼ in.....	61 43	
2½ in.....	63 48	
2½ to 5 in.....	69 55	
6 to 13 in.....	61 43	

2½ in. and smaller, over 18 ft., 10 per cent. net extra.

2½ in. and larger, over 22 ft., 10 per cent. net extra.
Less than carloads to destinations east of the Mississippi River will be sold at delivered discount for carloads lowered by two points, for lengths 22 ft. and under; longer lengths, f.o.b. Pittsburgh

Wire Rods.—Bessemer, open hearth and chain rods, \$33.
Steel Rivets.—Structural rivets, ¾-in. and larger, 2.25c., base; ½-in. and 11-16-in. take an advance of 15c., and ½-in. and 9-16-in. take an advance of 50c.; in lengths shorter than 1 in. also take an advance of 50c. Terms are 30 days, net cash, f.o.b. mill. The above prices are absolutely minimum on contracts for large lots, makers charging the usual advances of \$2 to \$3 a ton to the small trade.

Pittsburgh.

PARK BUILDING, March 2, 1910.—(By Telegraph.)

Pig Iron.—The Westinghouse Electric & Mfg. Company has come in the market for 15,000 tons of special analysis foundry iron for delivery over the last half of the year. Of this iron 6000 tons is class 1, running 1.50 to 2 in silicon, not over 0.05 in sulphur, 0.20 to 0.21 in phosphorus, and not over 1 per cent. in manganese; 6000 tons is class 2, running 2 to 2½ in silicon, 0.04 in sulphur, and other elements the same as in class No. 1; 3000 tons is class No. 3, running 2½ to 3 per cent. in silicon, with other elements the same as in class No. 2. All bids on this iron must be submitted on or before March 4. The National Radiator Company, Johnstown, is said to have bought 3000 to 4000 tons of No. 2 foundry for extended delivery and the Union Radiator Company, also of Johnstown, is reported to have bought 1000 tons. There is not much inquiry for Bessemer or basic, while gray forge is also very dull. We quote standard Bessemer iron at \$18, basic \$16, No. 2 foundry \$16.25, and gray forge \$15.25 to \$15.50, all at Valley furnace, the freight rate to the Pittsburgh district being 90 cents a ton.

Steel.—There is more or less new inquiry for small lots of billets and sheet and tin bars, and prices remain firm. We quote 4 x 4 in. Bessemer billets at \$27.50 to \$28, and Bessemer sheet and tin bars, \$28.50 to \$29. We quote 4 x 4 in. open hearth billets at \$29 to \$29.50; small billets, \$30 to \$31; sheet and tin bars, \$29 to \$29.50, and forging billets, \$32 to \$33, f.o.b. maker's mill.

(By Mail.)

A decided change for the better in sentiment has come over the steel trade in the past two weeks, and more optimistic talk as to the future is heard now than at any time since the lull in the steel business started last December. A number of sales agents of the leading steel companies report that their specifications against contracts, and also new orders in the last two weeks in February, were nearly double what they were in the first half of that month, and it is believed that business in March will show a heavy increase over February. More inquiries are in the market, and a good deal of tonnage in the various lines of finished iron and steel is being figured on, all indications pointing to more active trade in the near future. Plate specifications are coming in at a lively rate, and the two leading local mills have little tonnage to spare for delivery this side of July. There are more inquiries for structural jobs, and considerable work has been placed in the past week. The new demand for sheets is fairly active with specifications pouring into the mills, while in tin plate the makers are simply swamped with orders, and are compelled to turn away nearly every day nice business on which they cannot make deliveries wanted. Specifications on pipe were active in the last half of February, and trade in iron and steel bars and in wire products is looking up. Taken as a whole, the situation from the finishing end is decidedly more satisfactory, but when it comes to raw material, aside from steel, it is not so good. The one weak spot is pig iron. The decline in prices on Bessemer, basic, foundry and forge iron has been heavy, and consumers are going slow in making contracts, fearing that prices may be still lower. In iron and steel scrap there is a little more inquiry, and the tone at present is perhaps slightly firmer. Coke continues to drag somewhat, but we note that several large inquiries are in the market for delivery over the remainder of this year. The feeling is general that as soon as the country thaws out business will open up and conditions will become active. The retrenchment in buying by the railroads has been a disappointment, but in the last few days some nice inquiries for steel cars and other equipment have come out, and more buying by the railroads is expected. Basic conditions are good and by April 15, if not before, it is believed that the steel trade will be in much better shape than it is to-day.

Ferromanganese.—Consumers are pretty well covered, and there has not been much new buying in this district for some time. We quote 80 per cent. foreign for delivery over the next three or four months at \$43 to \$43.50, Baltimore, the freight for delivery in the Pittsburgh district being \$2.30 a ton.

Ferrosilicon.—This material continues quiet, only occasional small lots being sold for prompt delivery. Prices are fairly firm. We continue to quote 10 per cent. at \$23.90; 11 per cent., \$24.90; 12 per cent., \$25.90, and 50 per cent., \$62 to \$62.50, Pittsburgh, for prompt shipment. Sales of two carloads, or about 60 tons, for March and April delivery, are reported at \$62, Pittsburgh.

Muck Bar.—While prices on forge iron have declined fully \$1.50 a ton in the last month or six weeks, the local makers of muck bar have not reduced prices. It is figured that Northern forge can be delivered in the Pittsburgh district to-day at about \$16.15 to \$16.25, and it costs about \$13 for conversion into muck bar, or close to \$29 a ton. On this basis the price of muck bar is still quoted at \$30, which would seem to allow a profit of only about \$1 a ton. We continue to quote best grades of muck bar, made from all pig iron, at \$30 in long lengths, but possibly on a firm offer this might be shaded.

Rods.—There is not much new inquiry for rods, consumers being pretty well covered up to July, and are specifying at a fairly liberal rate against their contracts. Prices are firm, and we quote Bessemer, open hearth and chain rods at \$33, Pittsburgh.

Skelp.—The return of good weather will soon cause a materially increased consumption of plates going into pipe, and the skelp market is strong in price, with the mills pretty well filled up for the next two or three months. For ordinary widths and gauges we continue to quote grooved steel skelp at 1.50c. to 1.55c.; sheared steel skelp, 1.60c. to 1.65c.; grooved iron skelp, 1.80c., and sheared iron skelp, 1.90c., all f.o.b. mill, Pittsburgh.

Steel Rails.—The Carnegie Steel Company is receiving nearly every day small orders for standard sections, ranging from 200 tons up, but has not recently entered any large orders. It is not probable that any part of the 65,000 tons of rails for the Southern Railway will come to the local mill, but the Carnegie Steel Company has an inquiry for the axles for 3500 new cars for which this road is in the market. New orders were booked last week for over 2500 tons of light rails, in addition to specifications against contracts. The Louisville & Nashville Railroad has placed an order for 7000 kegs of track bolts and other large orders are said to be pending. We quote steel axles at 1.75c. to 1.80c. and splice bars, 1.50c., at mill, Pittsburgh. Light rail prices are as follows: 8 to 10 lb., \$32; 12 to 14 lb., \$29; 16, 20 and 25 lb., \$28; 30 and 35 lb., \$27.75, and 40 and 45 lb., \$27, Pittsburgh. These prices are for 250-ton lots and over, and for small lots premiums of 50c. per ton and more are being paid. We quote standard sections at \$28, at mill.

Plates.—The general contract for the Portland, Ore., water works is to be placed March 8, and as soon as it is known who gets this job it will furnish a pretty good line on whether the plates, about 10,000 tons, will come to local mills. The Carnegie Steel Company has received recently two orders for plates, one of 6600 tons and one of 5000 tons, for the Catskill aqueduct, and as soon as the specifications come in the company will commence to roll the plates. The Southern Railway is in the market for 3000 drop bottom steel coal cars, 500 hopper bottom steel coke cars and 100 steel flat cars, all to be of 50 tons capacity. The Western Maryland is in the market for 500 steel gondolas and 400 40-ton steel hopper cars. The Cincinnati, Hamilton & Dayton Railroad has placed orders for 500 steel gondola cars with the Pressed Steel Car Company, 500 similar cars with the Ralston Steel Car Company and 500 steel box cars with the American Car & Foundry Company. Local plate mills are well filled with orders, and some of the smaller mills are able to get as high as 1.60c. for plates for prompt delivery. We continue to quote $\frac{1}{4}$ -in. and heavier plates at 1.55c. in large lots and 1.60c. in small lots for prompt shipment. One of the Eastern plate mills is understood to have its order books pretty well cleaned up, and is naming slightly lower prices. For this reason local plate mills when competing with this concern on Eastern business are making a price of 1.50c., Pittsburgh, for delivery in Eastern territory.

Structural Material.—The market is more active, some good sized jobs having been placed in the past week, and considerable work is pending. Among this is a post office for Deaver, Colo., 3500 to 4000 tons, on which bids have gone in, and also a post office at Richmond, Va., about 2000 tons. The Jones & Laughlin Steel Company has taken 1600 tons for a union station for the Northern Central Railroad at Baltimore, while the McClintic-Marshall Construction Company has taken 600 tons for new steel buildings for A. M. Byers & Co. at Girard, Ohio, and about 300 tons for bridge work for the Chicago, Burlington & Quincy Railroad. The Cincinnati, Hamilton & Dayton Railroad has recently

placed 3500 to 4000 tons of bridge work, divided between two local concerns. Several other good jobs are about ready to place, and orders booked by the American Bridge Company in February are given as about 40,000 tons. We quote beams and channels up to 15 in. at 1.50c. minimum, for desirable orders, and 1.55c. to 1.60c. for general current orders.

Tin Plate.—The present activity in the tin plate trade is not confined to specifications against contracts, which are coming in very freely, but a large number of new orders are being placed, and in some cases consumers of tin plate are having trouble in finding mills that are able to take care of their orders and make the deliveries wanted. Several of the outside mills have recently taken good sized orders for tin plate at premiums of 5c. to 10c. per box over regular prices, and other tin plate interests that are filled up to July are turning down nice orders nearly every day, being unable to make the deliveries. The American Sheet & Tin Plate Company this week is operating 185 hot tin mills out of 235 serviceable mills, or 79 per cent. of its capacity. The company is constantly increasing its output, and is practically filled up on all the tin plate it can make for the next four months. Prices are firm, and we continue to quote 100-lb. cokes at \$3.00 per base box, f.o.b. Pittsburgh, for delivery up to July. We note several sales of large lots of tin plate at \$3.65 per base box.

Sheets.—All the leading sheet mills are pretty well filled up for the next three or four months, and in blue annealed there is a decided scarcity in supply, some mills being able to secure premiums of as much as \$3 to \$4 a ton where they can make the deliveries wanted by the customer. A recent sale is reported of 300 tons of blue annealed sheets, for which the buyer paid a premium of \$4 a ton for prompt delivery. The American Sheet & Tin Plate Company is operating 163 hot sheet mills out of 186 serviceable mills, its only idle plant being Aetna-Standard, which has 23 mills. The company has a few sheet mills off this week on account of engine troubles, but they will be running again in a few days. In spite of the idleness of the Aetna-Standard Works, which has a monthly capacity of 12,000 tons of sheets, the output of sheets by the American Sheet & Tin Plate Company in February was very close to being as large as in any one month in its history. Regular prices, on which premiums of \$3 and more a ton are being paid for prompt shipments of blue annealed sheets, are as follows: Blue annealed sheets, Nos. 3 to 8, 1.70c.; Nos. 9 and 10, 1.75c.; Nos. 11 and 12, 1.80c.; Nos. 13 and 14, 1.85c., and Nos. 14 and 15, 1.95c.; one-pass box annealed No. 28 black sheets, 2.40c., and No. 28 galvanized, 3.50c., at mill. We quote corrugated roofing sheets at \$1.70 per square for painted and \$3 for galvanized, $\frac{1}{2}$ -in. corrugations. Jobbers charge the usual advances over these prices for small lots from store.

Iron and Steel Bars.—The leading makers of steel bars have from four to six months' work on their books, much of it taken at lower prices than are ruling now, and buyers are specifying liberally against these contracts. The mills rolling iron bars are also pretty well filled up, but only a fair amount of new buying is being done, most consumers being covered. The consumption of steel bars in concrete work is very heavy and is steadily increasing. The railroads are pretty liberal buyers of iron bars, and one local mill is enjoying a nice trade in high grade iron bars which it rolls, and for which it obtains 1.90c., at mill. On contracts for delivery through the first half the leading steel bar mills are naming 1.45c., at mill, but on the general run of orders 1.50c. to 1.55c. is quoted. On iron bars 1.70c., Pittsburgh, is being named, but on very desirable orders it is stated that 1.65c. has recently been done.

Hoops and Bands.—A moderate amount of new business is being placed and specifications against contracts continue to come in freely. We quote steel hoops for forward delivery at 1.50c. to 1.60c., and for prompt shipment at 1.60c. to 1.65c., at mill. Steel bands are 1.45c. to 1.50c., on contracts, and from 1.60c. to 1.65c. for prompt shipment.

Spelter.—Last week a sale of 50 tons of spelter was made for delivery in this district at 5.32 $\frac{1}{4}$ c., East St. Louis, and this price probably represents low mark, as the market is much firmer to-day. We quote prime grades of Western spelter at 5.50c. to 5.55c., East St. Louis, the freight rate to Pittsburgh being 12 $\frac{1}{2}$ c. per 100 lb.

Spikes.—The situation is rather quiet as regards new orders, but railroads that placed contracts last year are specifying freely and spikes are moving out at a very satisfactory rate. We quote standard sizes of railroad spikes, 4 $\frac{1}{2}$ x 9-16 and larger, at \$1.70 for Western shipment and \$1.75 for local trade. Boat spikes are firm at \$1.75, base, and small railroad spikes at \$1.75, base. These prices are for carload and larger lots.

Shafting.—New demand for shafting continues quite heavy, particularly from automobile makers, while specifications against contracts continue to come in freely. The leading makers of cold rolled shafting are pretty well filled up for the next two or three months and shipments are heavy. It is stated that regular discounts are being firmly main-

Prices of Finished Iron and Steel F.O.B. Pittsburgh.

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Paul, 32c.; St. Louis, 22½c.; New Orleans, 30c.; Birmingham, Ala., 45c. Rates to the Pacific Coast are 80c. on plates, structural shapes and sheets, No. 11 and heavier; 85c. on sheets, Nos. 12 to 16; 95c. on sheets, No. 16 and lighter; 65c. on wrought pipe and boiler tubes.

Structural Shapes.—I-beams and channels, 3 to 15 in., inclusive, 1.50c. to 1.55c., net; I-beams over 15 in., 1.65c., net; H-beams over 8 in., 1.75c.; angles, 3 to 6 in., inclusive, ½ in. and up, 1.60c., net; angles over 6 in., 1.65c., net; angles, 3 x 3 in. and up, less than ½ in., 1.75c., base, half extras, steel bar card; tees, 3 in. and up, 1.65c., net; zees, 3 in. and up, 1.60c., net; angles, channels and tees, under 3 in., 1.50c., base, plus 10c., half extras, steel bar card; deck beams and bulb angles, 1.80c., net; hand rail tees, 2.80c., net; checkered and corrugated plates, 2.80c., net.

Plates.—Tank plates, ¾ in. thick, 6¼ in. up to 100 in. wide, 1.55c. to 1.60c., base. Following are stipulations prescribed by manufacturers, with extras to be added to base price (per pound) of plates:

Rectangular plates, tank steel or conforming to manufacturer's standard specifications for structural steel dated February 6, 1903, or equivalent, ¾-in. thick and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per square foot, are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼-in. thick on edge, or not less than 11 lb. per square foot, to take base price. Plates over 72 in. wide ordered less than 11 lb. per square foot down to the weight of 3-16-in. take the price of 3-16-in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Gauges under ¼-in. to and including 3-16-in. on thinnest edge.....	\$0.10
Gauges under 3-16-in. to and including No. 8.....	.15
Gauges under No. 8 to and including No. 9.....	.25
Gauges under No. 9 to and including No. 10.....	.30
Gauges under No. 10 to and including No. 12.....	.40
Sketches (including all straight taper plates), 3 ft. and over in length.....	.10
Complete circles, 3 ft. diameter and over.....	.20
Boiler and flange steel.....	.10
"A. B. M. A." and ordinary firebox steel.....	.20
Still bottom steel.....	.30
Marine steel.....	.40
Locomotive firebox steel.....	.50
Widths over 100 in. up to 110 in., inclusive.....	.05
Widths over 110 in. up to 115 in., inclusive.....	.10
Widths over 115 in. up to 120 in., inclusive.....	.15
Widths over 120 in. up to 125 in., inclusive.....	.25
Widths over 125 in. up to 130 in., inclusive.....	.50
Widths over 130 in.	1.00
Cutting to lengths or diameters under 3 ft. to 2 ft., inclusive.....	.25
Cutting to lengths or diameters under 2 ft. to 1 ft., inclusive.....	.50
Cutting to lengths or diameters under 1 ft.....	1.55
No charge for cutting rectangular plates to lengths 3 ft. and over.	

TERMS.—Net cash 30 days.

Sheets.—Minimum prices for mill shipments on sheets in carload and larger lots, on which jobbers charge the usual advances for small lots from store, are as follows: Black annealed sheets, Nos. 3 to 8, 1.70c.; Nos. 9 and 10, 1.75c.; Nos. 11 and 12, 1.80c.; Nos. 13 and 14, 1.85c.; Nos. 15 and 16, 1.95c. Box annealed sheets, Nos. 17 to 21, 2.20c.; Nos. 22 to 24, 2.25c.; Nos. 25 and 26, 2.30c.; Nos. 27, 2.35c.; Nos. 28, 2.40c.; Nos. 29, 2.45c.; Nos. 30, 2.55c. Galvanized sheets, Nos. 13 and 14, 2.50c.; Nos. 15 and 16, 2.60c.; Nos. 17 to 21, 2.75c.; Nos. 22 to 24, 2.90c.; Nos. 25 and 26, 3.10c.; Nos. 27, 3.30c.; Nos. 28, 3.50c.; Nos. 29, 3.60c.; Nos. 30, 3.85c. Painted roofing sheets, No. 28, \$1.70 per square. Galvanized roofing sheets, No. 28, \$3 per square, for 2½-in. corrugations.

Wrought Pipe.—The following are the discounts on the Pittsburgh basing card on carloads of wrought pipe which went into effect January 1:

	Steel.	Iron.	Steel.	Iron.
	Black.	Galv.	Black.	Galv.
½ and ¼ in.	70	54	65	.
¾ in.	71	57	66	.52
1½ in.	74	62	69	.57
¾ to 6 in.	78	68	73	.63
7 to 12 in.	72	57	67	.52
Plugged and Reamed,				
1 to 4 in.	76	66	71	.61
Extra Strong, Plain Ends.				
½ to ¾ in.	63	51	58	.46
½ to 4 in.	70	58	65	.53
4½ to 8 in.	66	54	61	.49
9, 10, 11 and 12 in.	54	42	..	..
Double Extra Strong, Plain Ends.				
½ to 8 in.	59	48	54	.43

The above steel pipe discounts are for "card weight," subject to the usual variation of 5 per cent.

Boiler Tubes.—Discounts on lap welded steel and charcoal iron boiler tubes to jobbers in carloads are as follows:

	Steel.	Iron.
1 to 1½ in.	.49	.43
1½ to 2½ in.	.61	.43
2½ in.	.63	.48
2½ to 5 in.	.69	.55
6 to 13 in.	.61	.43

2½ in. and smaller, over 18 ft., 10 per cent. net extra.

2½ in. and larger, over 22 ft., 10 per cent. net extra.

Less than carloads to destinations east of the Mississippi River will be sold at delivered discount for carloads lowered by two points, for lengths 22 ft. and under; longer lengths, f.o.b. Pittsburgh

Wire Rods.—Bessemer, open hearth and chain rods, \$33.

Steel Rivets.—Structural rivets, ¾-in. and larger, 2.25c., base; ½-in. and 11-16-in. take an advance of 15c., and ½-in. and 9-16-in. take an advance of 50c.; in lengths shorter than 1 in. also take an advance of 50c. Terms are 30 days, net cash, f.o.b. mill. The above prices are absolutely minimum on contracts for large lots, makers charging the usual advances of \$2 to \$3 a ton to the small trade.

Pittsburgh.

PARK BUILDING, March 2, 1910.—(By Telegraph.)

Pig Iron.—The Westinghouse Electric & Mfg. Company has come in the market for 15,000 tons of special analysis foundry iron for delivery over the last half of the year. Of this iron 6000 tons is class 1, running 1.50 to 2 in silicon, not over 0.05 in sulphur, 0.20 to 0.21 in phosphorus, and not over 1 per cent. in manganese; 6000 tons is class 2, running 2 to 2½ in silicon, 0.04 in sulphur, and other elements the same as in class No. 1; 3000 tons is class No. 3, running 2½ to 3 per cent. in silicon, with other elements the same as in class No. 2. All bids on this iron must be submitted on or before March 4. The National Radiator Company, Johnstown, is said to have bought 3000 to 4000 tons of No. 2 foundry for extended delivery and the Union Radiator Company, also of Johnstown, is reported to have bought 1000 tons. There is not much inquiry for Bessemer or basic, while gray forge is also very dull. We quote standard Bessemer iron at \$18, basic \$16, No. 2 foundry \$16.25, and gray forge \$15.25 to \$15.50, all at Valley furnace, the freight rate to the Pittsburgh district being 90 cents a ton.

Steel.—There is more or less new inquiry for small lots of billets and sheet and tin bars, and prices remain firm. We quote 4 x 4 in. Bessemer billets at \$27.50 to \$28, and Bessemer sheet and tin bars, \$28.50 to \$29. We quote 4 x 4 in. open hearth billets at \$29 to \$29.50; small billets, \$30 to \$31; sheet and tin bars, \$29 to \$29.50, and forging billets, \$32 to \$33, f.o.b. maker's mill.

(By Mail.)

A decided change for the better in sentiment has come over the steel trade in the past two weeks, and more optimistic talk as to the future is heard now than at any time since the lull in the steel business started last December. A number of sales agents of the leading steel companies report that their specifications against contracts, and also new orders in the last two weeks in February, were nearly double what they were in the first half of that month, and it is believed that business in March will show a heavy increase over February. More inquiries are in the market, and a good deal of tonnage in the various lines of finished iron and steel is being figured on, all indications pointing to more active trade in the near future. Plate specifications are coming in at a lively rate, and the two leading local mills have little tonnage to spare for delivery this side of July. There are more inquiries for structural jobs, and considerable work has been placed in the past week. The new demand for sheets is fairly active with specifications pouring into the mills, while in tin plate the makers are simply swamped with orders, and are compelled to turn away nearly every day nice business on which they cannot make deliveries wanted. Specifications on pipe were active in the last half of February, and trade in iron and steel bars and in wire products is looking up. Taken as a whole, the situation from the finishing end is decidedly more satisfactory, but when it comes to raw material, aside from steel, it is not so good. The one weak spot is pig iron. The decline in prices on Bessemer, basic, foundry and forge iron has been heavy, and consumers are going slow in making contracts, fearing that prices may be still lower. In iron and steel scrap there is a little more inquiry, and the tone at present is perhaps slightly firmer. Coke continues to drag somewhat, but we note that several large inquiries are in the market for delivery over the remainder of this year. The feeling is general that as soon as the country thaws out business will open up and conditions will become active. The retrenchment in buying by the railroads has been a disappointment, but in the last few days some nice inquiries for steel cars and other equipment have come out, and more buying by the railroads is expected. Basic conditions are good and by April 15, if not before, it is believed that the steel trade will be in much better shape than it is to-day.

Ferromanganese.—Consumers are pretty well covered, and there has not been much new buying in this district for some time. We quote 80 per cent. foreign for delivery over the next three or four months at \$43 to \$43.50, Baltimore, the freight for delivery in the Pittsburgh district being \$2.30 a ton.

Ferrosilicon.—This material continues quiet, only occasional small lots being sold for prompt delivery. Prices are fairly firm. We continue to quote 10 per cent. at \$23.90; 11 per cent., \$24.90; 12 per cent., \$25.90, and 50 per cent., \$62 to \$62.50, Pittsburgh, for prompt shipment. Sales of two carloads, or about 60 tons, for March and April delivery, are reported at \$62, Pittsburgh.

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tained, these being 55 per cent. off in carloads and 50 per cent. in less than carloads, delivered in base territory.

Rivets.—The new demand for rivets is showing betterment, and buyers are specifying freely against contracts, some of which were placed a good while ago at lower prices than are ruling now. Prices are given elsewhere in this issue.

Wire Products.—As soon as the country thaws out it is believed that the new demand for wire nails, cut nails and wire fencing will show a material increase. Jobbers specified very freely against contracts in November and December, thus accumulating large stocks, and owing to the frozen up condition of the country roads these stocks have not moved out as freely as anticipated. For this reason new buying in wire products is quiet and specifications on unfilled contracts are not coming in freely. In the case of contracts made prior to December 11, for shipment within 60 days, these have been extended by the mills, it being realized that, owing to unusual conditions, consumers were not in position to specify as freely as would otherwise have been the case. The Cut Nail Manufacturers' Association met in Philadelphia last week and fixed prices of cut nails at \$1.85, base, f.o.b. Pittsburgh. We quote wire nails at \$1.85 in carload and larger lots; painted barb wire, \$1.85; galvanized, \$2.15; annealed fence wire, \$1.65; galvanized, \$1.95, and cut nails, \$1.85, all f.o.b. cars, Pittsburgh, usual terms, with full freight to destination added.

Merchant Pipe.—Announcement is made that the Arkansas Natural Gas Company has sold all its bonds and has secured rights of way for its proposed Kansas gas line, and will probably place its contract for 200 miles of line pipe within a very short time. It is stated that specifications against contracts for pipe in the last half of February were quite heavy, and that that month showed an increase over January in orders and specifications entered. As soon as the country thaws out and pipe laying commences again there will be a material increase in new business. The mills advise us that regular discounts, printed elsewhere in this issue, are being firmly held.

Boiler Tubes.—There is more liberal buying of locomotive tubes by railroads and locomotive builders. The demand for merchant tubes is also picking up, with every prospect that just as soon as favorable weather returns there will be a still heavier demand. It is stated that regular discounts are being firmly held.

Coke.—Another meeting of the coke operators interested in the project of forming a selling agency to handle their output has been held, and this movement is assuming tangible shape. The output of coke is also being reduced in an effort to strengthen prices. Two large inquiries from the East are in the market for furnace coke, one furnace interest inquiring for 15,000 tons a month, commencing April, for the remainder of the year, and another asking for 6000 tons a month, commencing March, for the remainder of the year. It is specified in these inquiries that the coke must analyze less than 1 per cent. in sulphur, and it is not improbable this business may be closed on the basis of about \$2.50 a net ton at oven. We quote standard makes of furnace coke running less than 1 per cent. in sulphur at \$2.50 to \$2.60, while other makes of furnace coke running higher than 1 per cent. are offered at somewhat lower prices. The best makes of 72-hour foundry coke are quoted at \$2.60 up to \$3.15 per net ton, at oven, while other makes not so favorably known can be had as low as \$2.25. The output of coke in the Upper and Lower Connellsville region last week was 452,950 net tons, a slight decrease over the previous week.

Iron and Steel Scrap.—In sympathy with the general situation in the steel trade there is a better feeling in scrap, inquiries being more plentiful, and it is believed that prices are probably as low as they will go, for the time being at least. The leading consumer of scrap in this district is reported as buying heavy steel scrap right along and at about \$16.75, delivered. Other leading consumers are pretty well covered and are not actively in the market. Dealers quote about as follows, per gross ton, for delivery at Pittsburgh or elsewhere, as noted:

Heavy steel scrap, Steubenville, Fol-	
lansbee, Sharon, Monessen and Pitts-	
burg	\$16.50 to \$16.75
No. 1 foundry cast	16.50
No. 2 foundry cast	15.75 to 16.00
Bundled sheet scrap, at point of ship-	
ment	14.00 to 14.25
Rerolling rails, Newarris and Cambridge,	
Ohio, and Cumberland, Md.	18.00 to 18.50
No. 1 railroad malleable scrap	15.75 to 16.00
Grate bars	12.50
Low phosphorus melting stock	21.00
Iron car axles	26.50 to 27.00
Steel car axles	21.00 to 21.25
Locomotive axles	27.50 to 28.00
No. 1 busheling scrap	15.50
No. 2 busheling scrap	11.00
Old car wheels	16.75 to 17.00
Sheet bar, crop ends	17.50
Cast iron borings	9.50 to 10.00
Machine shop turnings	11.75 to 12.00

The offices of Walter-Wallingford & Co., brokers in pig iron, coke and alloys, have been removed from 601 People's

Building to rooms 2216-16A in the Farmers' Bank Building, Pittsburgh.

Chicago.

FISHER BUILDING, March 2, 1910.—(By Telegraph.)

There is a general improvement in the feeling among steel men in the Chicago market this week. The conditions which created uneasiness a few weeks ago have passed and buyers are showing more confidence in the steel market, at least in business conditions for the future. The agricultural implement manufacturers are inquiring for prices as the basis for contracts for their next year, beginning July 1, covering their requirements both in bars and the special lines of steel, which they use in large quantities. There is more new business in sheets as well as in current orders for plates. Chicago mills are sold so far ahead on bars that they do not quote except to old customers, and the wire interests expect a very active distributing movement through the jobbing trade in the next 30 to 60 days, following a winter when they have not been able to keep pace with the demand from industrial buyers. Structural business for buildings is coming forward more freely after the hesitation of January and February. The railroads have been light buyers of bridge material for two years, but are figuring on large requirements, and the fabricating interests anticipate more business than they will be able to take care of and make the deliveries which buyers will expect, as the fabricators already have several months' work on their books. The local mills continue short of steel for their finishing departments, and none of them can quote on inquiries for billets. The scrap market is easier and buyers are indifferent, awaiting larger receipts, which they expect with the advent of spring weather. The current demand for metals is light in the jobbing trade. There is still much complaint of car shortage and delays of freight in transit, chiefly owing to shortage of motive power on the railroads.

Pig Iron.—The iron market has not shared the improvement in tone which is noted this week in steel and finished products. The remarkable dullness of the past four months, following the boom last fall, has extended into March, repeating the experience of last year, when values declined until March. Buyers generally appear to have covered their requirements for the first half, and offers of Southern iron at \$13.50, for delivery to July 1, fail to awaken more than scattering inquiries for small lots. Certificate iron is being offered freely at \$13 in this market, and in a few cases Southern furnaces are willing to make spot shipments from their own stocks at \$13, Birmingham. Scattering orders for third quarter are reported at \$14, and in one unusual case a sale of No. 2 foundry was made last week at \$15 by a Southern interest, which is still holding for that figure. While it is known that a large amount of railroad equipment business is pending, and it is generally believed that this will make a material increase in the demand for iron, buyers will not actually come into the market for the iron until they have closed the contracts which they will seek to cover, and it takes time for the business to assume this definite form, after the delays by the railroads in placing their orders in January and February. Northern iron has declined 50c. in sympathy with the decline in Southern grades and the general apathy in the market. Local furnace interests, however, are not seeking business as they are well sold up for the first half. It was expected that the reduction in freight rates in February from southern Ohio furnaces into this territory would be readjusted by the railroads, but nothing has been done, and this has proved an important factor in reducing Chicago prices of Northern foundry and malleable Bessemer. No change is reported in high silicon iron. The following quotations are for March and April shipment, Chicago delivery:

Lake Superior charcoal	\$19.50 to \$20.00
Northern coke foundry, No. 1	19.00 to 19.50
Northern coke foundry, No. 2	18.50 to 19.00
Northern coke foundry, No. 3	18.00 to 18.50
Northern Scotch, No. 1	18.50 to 19.00
Southern coke, No. 1	18.35 to 18.85
Southern coke, No. 2	17.85 to 18.35
Southern coke, No. 3	17.35 to 17.85
Southern coke, No. 4	16.85 to 17.35
Southern coke, No. 1 soft	18.35 to 18.85
Southern coke, No. 2 soft	17.85 to 18.35
Southern gray forge	16.60 to 17.10
Southern mottled	16.35 to 16.85
Malleable Bessemer	18.50 to 19.00
Standard Bessemer	20.40 to 20.90
Jackson Co. and Kentucky silvery, 6%	21.40 to 21.90
Jackson Co. and Kentucky silvery, 8%	22.40 to 22.90
Jackson Co. and Kentucky silvery, 10%	23.40 to 23.90

(By Mail.)

Billets.—Consumers apparently have less difficulty in covering their requirements, as offerings at Eastern mills are more plentiful. The local mills, however, continue short of steel for their finishing departments.

Rails and Track Supplies.—An Eastern road has ordered 10,000 tons of open hearth rails to be rolled at Gary. Aside from this, new business in standard sections is light. Lumbermen are steady buyers of light sections for logging

roads, and there is no end to specifications for track supplies, which continue in excess of the capacity of the mills. We quote standard railroad spikes at 1.85c. to 1.95c., base; track bolts and square nuts, 2.40c. to 2.60c., base, all in carloads, Chicago. Light rails, 40 to 45 lb., \$27; 30 to 35 lb., \$27.75; 16, 20 and 25 lb., \$28; 12 lb., \$29, Chicago.

Structural Material.—Investors in steel buildings are showing less hesitation in closing contracts, and the business done last week represented a satisfactory improvement over previous weeks in this line. Among other attractive projects which are pending in Chicago is a bank building which will require 7000 tons, and there is an unusual amount of structural business in prospect in Western cities. The office estimating forces are unable to keep up with inquiries, and it is believed that in the near future there will be many disappointed seekers of fabricated material who will be unable to get the deliveries they want. The business closed last week in Chicago includes 770 tons for the American Medical Association Building, which went to the Gage Structural Steel Company; 700 tons for an addition to the McCormick Works of the International Harvester Company, which went to the Morava Construction Company; the Sinaite Temple, 347 tons, which was taken by the Hansell-Elcock Company, and 1000 tons of track elevation work for the Chicago Terminal Transfer Railroad, which went to the Chicago Bridge & Iron Company. The Modern Construction Company, Waukesha, Wis., took the contract for a coal handling plant, 350 tons, for the Reiss Coal Company, at Sheboygan, Wis. The American Bridge Company booked 260 tons for a coal handling plant for the Zenith Furnace Company, Duluth, Minn. The McClintic-Marshall Construction Company has booked about 350 tons of bridge work for the Chicago, Burlington & Quincy Railroad. Inquiries are coming in more freely from Western roads for bridge material. We quote plain material from mill, 1.78c. to 1.88c., Chicago; from store, 2c., Chicago.

Plates.—Eastern mills represented in this market are receiving a very satisfactory run of new orders for plates for prompt or early shipment. Chicago mills are loaded up with specifications for steel cars, with the prospect of a steady run of business the coming year on car orders from Western railroads. The plate mill capacity of the Chicago district is far short of the demand of the Western market, and progress is slow on the plate mills at Gary on account of delays in getting electrical equipment. We quote mill prices at 1.78c. to 1.88c., Chicago; store prices, 2c., Chicago.

Sheets.—New business is increasing in sheets. Buying slackened somewhat in the general lull a few weeks ago, but for two or three weeks there has been a steady gain in the volume of orders and inquiries, which shows that the consumptive demand has not been affected. We quote as follows, Chicago: No. 10 annealed, 1.93c.; No. 28 black, 2.58c.; No. 28 galvanized, 3.68c. Prices from store, Chicago, are: No. 10 blue annealed, 2.25c. to 2.35c.; No. 28 black, 2.90c. to 3c.; No. 28 galvanized, 4c. to 4.10c.

Bars.—The agricultural implement manufacturers have fared so badly on deliveries this winter that they have been making tentative inquiries regarding prices and contracts for their next year, running from July 1. The Western mills, however, have specifications and contracts for soft steel bars which will keep them busy for four to six months, or well past July 1, and they have not been willing to make prices for a year from July 1. The bar market is in a very strong position, as consumption is not likely to be affected by political conditions, and the agricultural demand, which will come in earlier than last year, will begin crowding the mills as soon as the business now on the books can be cleared up. On soft steel bars the mills here show no inclination to take new business, as they cannot take anything for early delivery and are reluctant to quote for June or July shipment. It is understood, however, that in some cases business is taken for deferred shipment about \$1 under present quotations. Hard steel bars remain firm and are in very good demand. Bar iron has weakened \$1 a ton, following the decline in scrap. Railroad specifications continue good, and there is quite a little new business from roads which buy their bar iron from month to month. The farm wagon manufacturers, who continue to use iron tires, will begin specifying soon for their active summer trade. Subject to the usual delay in delivery of soft steel bars, we quote as follows: Soft steel bars, 1.68c. to 1.78c.; bar iron, 1.55c. to 1.60c.; hard steel bars rolled from old rails, 1.60c. to 1.65c., all Chicago.

Rods and Wire.—The wire interests have suffered more from car shortage and delays in transit than any other branch of the trade. The railroads have not had the motive power to take care of the traffic, and in many cases a mill has had 50 to 75 carloads of wire products awaiting shipment for which it could not get cars. Industrial consumers of rods and wire have had a strenuous time keeping their plants supplied with material, and the railroads have been unable thus far to overcome the delays in transit and in furnishing cars. The distributing movement of wire products through jobbers is expected to be unusually active during the next 30 or 60 days, as the natural sequence to the long severe winter, which has prevented outdoor activity.

Some time ago an Eastern independent mill made a concession in prices for March shipment which disturbed the market somewhat, but this is believed to be a closed incident. It has apparently had the effect of postponing the advance in prices which was contemplated some time ago, to become effective in February. We quote Bessemer, open hearth and chain rods at \$36, Chicago. Jobbers' carload prices, which are quoted to manufacturing buyers, are as follows: Plain wire, No. 9 and coarser, base, 1.83c.; wire nails, 2.03c.; painted barb wire, 2.03c.; galvanized, 2.33c., all Chicago.

Merchant Steel.—The agricultural implement manufacturers are in the market for their supply of special steel for the year beginning July 1, and it is expected that the mills will decide upon prices within the next week or 10 days. In the agricultural trade there are so many adaptations of Bessemer, open hearth and crucible analysis steel, each suited to some special purpose, that no base price can be quoted. It is understood, however, that prices for next year will represent a fair advance over the contract level which was established a year ago. The mills which specialize on machinery steel now have four to six months' business on their books, and buyers realize that they must anticipate their requirements to obtain satisfactory deliveries.

Cast Iron Pipe.—The United States Cast Iron Pipe & Foundry Company is the only bidder on the readvertised water pipe letting of the city of Chicago. This business may range from 4000 to 8000 tons, the option regarding the quantity making the letting one that is not very attractive to foundries. At Cleveland, Ohio, it is expected that the same interest will obtain 2000 tons of water pipe business which is to be let to-day. At Rockford, Ill., 600 tons of water pipe we quote, per net ton, Chicago, as follows: Water pipe, 4-in., \$28.50; 6 to 12 in., \$27.50; 16-in. and up, \$26.50, with \$1 extra for gas pipe.

Old Material.—The near approach of spring weather, the indifference of buyers and the decline in pig iron have combined to exert a depressing effect on the scrap market, with recent political agitation fresh in the minds of buyers as a bear argument. A year ago there was a steady decline in values of scrap from October until March, but the winter was relatively mild and material came in freely during the winter months. This season there has been a continuous decline from September to March, but the winter has been very severe and the movement of scrap has been light for three months. Sales by railroads have been very light, but their offerings will be larger when they begin their spring clean-up, and the movement from the country will also begin with milder weather. At the time the flood of scrap came into the market last fall the leading mill consumers were selling their products three to six months ahead, and they bought heavily to cover their sales. They have followed an indifferent policy ever since, taking material only when offered them at concessions, yet increasing their stocks, in many cases, without seeking scrap. In view of all these facts the next 30 to 60 days will prove an interesting period in the scrap market. Many dealers throughout the country have stocks which they have carried for two years, and some of the railroads also have large accumulations, which will be increased when they begin track work after the frost comes out of the ground. The scrap problem contains more than the usual number of unknown quantities. Meantime, values have declined the past week and it is hard work for the dealers to place the small consignments that arrive in the market. The following prices are per gross ton, delivered, Chicago:

Old iron rails.....	\$19.00 to \$19.50
Old steel rails, rerolling.....	17.50 to 18.00
Old steel rails, less than 3 ft.....	16.50 to 17.00
Reelaying rails, standard sections, subject to inspection.....	24.00 to 25.00
Old car wheels.....	17.00 to 17.50
Heavy melting steel scrap.....	15.00 to 15.50
Frogs, switches and guards, cut apart.....	15.00 to 15.50
Shoveling steel.....	14.50 to 15.00

The following quotations are per net ton:

Iron angles and splice bars.....	\$17.00 to \$17.50
Iron car axles.....	21.00 to 22.00
Steel car axles.....	22.00 to 23.00
No. 1 railroad wrought.....	14.25 to 14.75
No. 2 railroad wrought.....	13.25 to 13.75
Springs, knuckles and couplers.....	14.25 to 14.75
Locomotive tires, smooth.....	18.50 to 19.00
No. 1 dealers' forge.....	12.00 to 12.50
Steel axle turnings.....	11.00 to 11.50
Machine shop turnings.....	9.75 to 10.25
Cast and mixed borings.....	6.50 to 7.00
No. 1 busheling.....	12.50 to 13.00
No. 2 busheling.....	9.50 to 10.00
No. 1 boilers, cut to sheets and rings.....	11.00 to 11.50
No. 1 cast scrap.....	14.50 to 15.00
Stove plate and light cast scrap.....	12.50 to 13.00
Railroad malleable.....	14.50 to 15.00
Agricultural malleable.....	13.00 to 13.50
Pipes and flues.....	11.50 to 12.00

Metals.—Trade is rather dull in the metal market, consumers pursuing a waiting policy until general business conditions show greater activity. Casting copper is unchanged, but lake is quoted a shade lower. Concessions are rumored on lead but not confirmed. In spelter one of the large smelt-

ing companies has become financially embarrassed, and this has had the peculiar effect of arresting the decline, by taking a large stock out of the market temporarily. We quote Chicago prices as follows: Casting copper, 13½c.; lake, 14c., in carloads, for prompt shipment; small lots, ¼c. to ¾c. higher; pig tin, car lots, 33½c.; small lots, 35c.; lead, desilverized, 4.60c. to 4.70c., for 50-ton lots; corroding, 4.85c. to 4.95c., for 50-ton lots; in carloads, 2½c. per 100 lb. higher; spelter, 5.60c. to 5.65c.; Cookson's antimony, 10½c., and other grades, 9¾c. to 10½c.; sheet zinc is \$7.50, f.o.b. La Salle, in carloads of 600-lb. casks. On old metals we quote: Copper wire, crucible shapes, 13½c.; copper bottoms, 12c.; copper clips, 13½c.; red brass, 12½c.; yellow brass, 10c.; light brass, 7c.; lead pipe, 4½c.; zinc, 5.25c.; pewter, No. 1, 23c.; tin foil, 26c.; block tin pipe, 28c.

Philadelphia.

PHILADELPHIA, PA., March 1, 1910.

There has been more small lot buying in pig iron, plates and shapes, while billets show greater activity. On the whole, however, the market continues to drag. The uncertainty regarding prices has, no doubt, considerable influence in this connection, buyers feeling that until things become more active the possibility of higher prices is remote, and that in purchasing in small lots for early delivery they get the benefit of small concessions. Sellers, while not forcing business, are inclined to shade quotations for prompt shipments, but are not anxious to take on business for extended shipment. Any material buying movement would, no doubt, result in a distinct hardening of prices. The general undertone of the market appears firmer, and it is believed that a large volume of business will develop early in the spring. The old material market presents a waiting appearance, with business practically at a standstill in most grades. Coke is dull and prices are not strong.

Pig Iron.—A greater volume of small lot buying in the foundry grades is noted. A number of sellers report quite a fair aggregate, made up of orders for 25 to 100 ton lots for early delivery, with occasional sales of larger quantities for shipment extending over the remainder of the first half of the year. Deliveries on orders are reported by sellers as being taken freely, which would indicate that consumption is being maintained on a comparatively even basis. In a few instances buyers have underestimated their first half requirements and are coming into the market for further moderate quantities. Occasional small sales of No. 2 X foundry at \$18.75 to \$19 are being made, although \$18.50, delivered, represents the more general asking price for standard brands. How much this can be shaded depends largely on the customer, tonnage, delivery and how sharp competition is for the order. From some sellers \$18.25, delivered, could, no doubt, be obtained, while on some brands \$18, delivered, is quoted. Sellers making sharp concessions endeavor, as a rule, to keep such transactions pretty well covered. The movement in Virginia foundry iron has been less pronounced, buying has diminished, and the bulk of the business has been in small prompt lots. A number of sellers hold No. 2 X at \$15.50, furnace, but as low as \$15 can be done, bringing quotations to a range of \$18 to \$18.50, delivered in this vicinity, during the remainder of the first half. A further movement in pipe making grades is noted. A number of furnaces have been producing more off grades of iron recently, a good share of which goes to the cast iron pipe makers, usually at low prices. Purchases of some fairly good brands of iron have also been recently taken by those interests. Southern iron is being more aggressively offered by sellers in this territory, No. 2 foundry for prompt and second quarter delivery being offered at \$13 and \$13.50, Birmingham. Sales, however, have not been numerous, although several fair sized lots of No. 4 iron have been sold to the pipe interests. There has been a trifle better demand for forge iron, but sales have been usually in small lots. Prices range around \$17 to \$17.50, delivered, dependent on tonnage and delivery. The steel making grades have been quiet. Producers of basic are, in many cases, getting behind in deliveries, but as the majority of melters have pretty fair stocks they have so far experienced no inconvenience from delayed shipments. Being pretty well covered, as far as requirements in this grade during the first half are concerned, melters show little interest in the market. Sellers have little iron to offer, and prices continue nominal, at \$18.50, delivered. Offers of prompt basic at a concession by outside interests have not resulted in business. Low phosphorus iron is more quiet. Makers in this territory still encounter difficulties in obtaining ore supplies, and standard low phosphorus iron is not plentiful, sellers maintaining prices firmly, although considerably lower quotations have been named for off grades. The general undertone of the market appears somewhat stronger, although there is no disposition shown either by buyers or sellers to enter into contracts for extended delivery, the tendency of both sides being to await further developments before making long time commitments. Quotations for delivery during the first half are irregular and depend largely on individual circumstances governing the transaction. The

following quotations about represent the range of prices for delivery in buyers' yards, eastern Pennsylvania and nearby points:

Eastern Pennsylvania, No. 2 X foundry	\$18.00 to \$18.50
Eastern Pennsylvania, No. 2 plain	17.50 to 18.00
Virginia, No. 2 X foundry	18.00 to 18.50
Virginia, No. 2 plain	17.50 to 18.00
Gray forge	17.00 to 17.50
Basic	18.50
Standard low phosphorus	23.00 to 24.00

Ferromanganese.—No demand has developed and the market continues practically at a standstill. Nominal quotations range from \$43.50 to \$44, Baltimore, dependent on tonnage and delivery, but it is believed that these figures would be shaded on a desirable order for prompt shipment.

Billets.—Inquiries for some good sized lots for first half delivery have come out, and the market shows increased activity. Makers in this territory have booked some very good orders, and the prices are strong at \$30, Eastern mill, for ordinary open hearth rolling billets, equal to \$30.00, delivered in this vicinity. Specifications on old contracts are reported as coming forward freely. Forging billets are firm at \$32 to \$34, f.o.b. mill, dependent on analysis, delivery and tonnage.

Plates.—Quotations appear to be somewhat firmer, and concessions on recent prices are not so readily obtained. Eastern mills generally adhere firmly to 1.75c. minimum for ordinary plates, although outside mills will, it is believed, slightly shade that figure for desirable business. For the ordinary run of orders 1.75c. to 1.80c., delivered in this territory, about represents the market. Business during the week has been confined closely to small lots for early shipment, the aggregate of which, however, represents a fair total.

Structural Material.—Some weakness in prices is still noted for plain shapes. Mills, which are pretty well supplied with business, hold quite firmly to 1.75c. minimum, delivered in this territory; others, more anxious for tonnage, name 1.70c., delivered, as their price. The concession has not, we understand, brought out any increased tonnage. Orders have been comparatively light. Considerable business of a miscellaneous character has been entered, while several contracts requiring quite a good tonnage are pending.

Sheets.—The demand for sheets continues exceedingly strong. The bulk of the orders, however, are of moderate size, but in the aggregate are more than enough to keep mills occupied, and in many sizes prompt deliveries are hard to get, and when available command a sharp premium. Customers are urging deliveries which makers find it difficult to meet. Prices are firmly maintained, ranging as follows for reasonably early deliveries: Nos. 18 to 20, 2.80c.; Nos. 22 to 24, 2.90c.; Nos. 25 and 26, 3c.; No. 27, 3.10c.; No. 28, 3.20c.

Bars.—Little buying has developed, the bulk of the business transacted being in small unimportant lots. While the leading producers maintain prices of refined iron bars at about 1.70c., delivered, other sellers accept business at close to 1.60c., delivered. No heavy sales are made, however, at either level. Steel bars are not active, owing to unsatisfactory deliveries, quotations ranging from 1.60c. to 1.65c., delivered in this vicinity.

Coke.—Sales are mainly in small lots for prompt shipment little disposition being shown to enter contracts under ruling conditions. The market is weak, although no further price recessions are to be noted. The following range of prices per net ton is quoted for good grades delivered in this vicinity:

Connellsburg furnace coke	\$4.25 to \$4.60
Foundry coke	5.00 to 5.50
Mountain furnace coke	3.85 to 4.20
Foundry coke	4.60 to 5.10

Old Material.—The market continues to drag, and hardly enough business has been done in any grade to establish a market. Both buyers and sellers are marking time, awaiting further developments. The associated steel mills representative is taking on no further tonnage of any grade, the mills being well supplied with old material. Arrivals of foreign scrap are, however, being freely taken by the mills. Rolling mills show but little interest in the market. Quotations are largely nominal. The following, however, about represent the range of prices at which sellers would do business for prompt delivery in buyers' yards in this territory:

No. 1 steel scrap and crops	\$16.50 to \$17.00
Old steel rails, rerolling	17.50 to 18.00
Low phosphorus	22.50 to 23.00
Old steel axles	22.50 to 23.50
Old iron axles	27.50 to 28.00
Old iron rails	20.00 to 21.00
Old car wheels	16.75 to 17.25
No. 1 railroad wrought	18.50 to 19.00
Wrought iron pipe	16.00 to 16.50
No. 1 forge fire	15.00 to 15.50
No. 2 light iron	10.25 to 10.75
Wrought turnings	13.00 to 13.50
Cast borings	11.50 to 12.00
Machinery cast	16.00 to 16.50
Railroad malleable	16.00 to 16.50
Grate bars	14.00 to 14.50
Stove plate	12.50 to 13.00

Cleveland.

CLEVELAND, OHIO, March 1, 1910.

Iron Ore.—The only sales reported are of small lots. Two or three Eastern furnace interests are figuring on Lake Superior ore and are expected to buy as soon as they decide what to use. Milder weather has resulted in an increase of shipments from the docks. Some fairly good shipping orders for Bessemer have come in during the past few days. We quote prices as follows: Old Range Bessemer, \$5; Mesaba Bessemer, \$4.75; Old Range Non-Bessemer, \$4.20; Mesaba Non-Bessemer, \$4.

Pig Iron.—The market continues almost lifeless. Practically no sales have been made by local interests and sales agencies in this territory or in other districts that they reach. Inquiries have been scarce, and the only ones received have been for small lots. Melters are not ready to buy foundry iron for the last half and the leading producers are awaiting developments, not attempting to force sales under present conditions. Prices are weak. Some of the sellers are making nominal quotations, which would doubtless be materially shaded should they receive a good inquiry. In the absence of buying local furnaces continue to quote No. 2 foundry at \$17.50, delivered, Cleveland. In the Valley No. 2 foundry is quoted at \$16.25 to \$16.50 for spot shipment and the remainder of the first half, and \$16.50 for the last half. There are reports, however, of No. 2 foundry being offered as low as \$16.10, Valley furnace, for spot shipment. The sale of a small tonnage is reported in the Valley at \$16.50 for No. 2 for third quarter delivery. Some shipments of foundry iron are being held back, but furnacemen generally have no complaint to make of the way iron is being taken on contract. Foundries generally continue busy, but they appear to be well covered for their pig iron requirements through the first half. Malleable iron consumers are taking their iron promptly under contracts. For prompt shipment and the remainder of the first half we quote, delivered, Cleveland, as follows:

Bessemer	\$18.90
Northern foundry, No. 1	\$17.50 to 17.75
Northern foundry, No. 2	17.15 to 17.40
Northern foundry, No. 3	16.65 to 16.90
Gray forge	16.90
Southern foundry, No. 2	17.35 to 17.85
Jackson County silvery, 8 per cent. silicon	21.55

Coke.—Prices continue weak and there is little demand. Considerable foundry coke for prompt shipment is being offered. Standard Connellsville furnace coke is quoted at \$2 or under to \$2.25 per net ton, at oven, for spot shipment, and \$2.25 on contracts. We quote standard Connellsville foundry coke at \$2.90 to \$3 for spot shipment and \$3 on contract.

Finished Iron and Steel.—Not only is the general feeling better, but there has been an improvement in specifications during the week. New business is also somewhat better, but orders are mostly for small lots. The increased demand is mainly in steel bars. Some bar contracts for second quarter specifications have been placed, one being for 1000 tons. Some of the agricultural implement makers are feeling the market for contracts for a year from July 1, but the mills do not appear ready to close. Deliveries on steel bars seem to be about as hard to get as ever. Local warehouse stocks are low, and on some sizes jobbers have not yet secured deliveries on September and October specifications. While nearly all the mills are holding steel bars firmly at 1.50c., Pittsburgh, a 1.45c. price can be secured on a desirable order for future delivery. The demand for plates continues only fair. One mill agency that is able to promise early deliveries reports the receipt of a number of orders for shipment within three or four weeks at 1.55c., Pittsburgh. Others are quoting 1.55c. to 1.60c., Pittsburgh, according to the desirability of the order. The demand for structural material continues rather light, with prices firm at 1.55c. to 1.60c., Pittsburgh. Considerable new building work is being figured on, but it is slow in coming out. The Forest City Steel & Iron Company, Cleveland, has taken the following contracts: White Sewing Machine Company, Cleveland, new plant, 750 tons; Mahoning Bank, Youngstown, 450 tons, and the Priscilla Theater, Cleveland, 100 tons. It is reported that the Erie Railroad will build a new two-track lift bridge in Cleveland. The demand for sheets continues fairly active and prices are firm. The demand for iron bars is less active and prices are a little easier. We quote iron bars at 1.55c. to 1.60c., Cleveland. A western New York car company is in the market for 2000 tons of steel bars for delivery until July 1, and if unable to secure shipments as desired will probably buy that tonnage in iron bars. Little business is coming at present from the railroads in this territory. Jobbers report a good volume of business. Many warehouse orders for steel bars are coming from manufacturers who are unable to secure mill shipments as desired.

Old Material.—The market continues dull. Prices apparently have declined no further, but there have not been enough transactions to establish a market, and all quotations are largely nominal. Mills are taking scrap freely on con-

tract, but show no inclination to buy for future requirements. Yard dealers are doing much buying for additions to their stocks. Railroad offerings this week include lists from the Erie and the Pennsylvania Lines, West, the former closing March 1 and the latter March 3. Prices per gross ton, f.o.b. Cleveland, are as follows:

Old steel rails	\$16.00 to \$16.50
Old iron rails	18.00 to 18.50
Steel car axles	20.00 to 20.50
Heavy melting steel	15.00 to 15.50
Relaying rails, 50 lb. and over	22.50 to 23.50
Agricultural malleable	14.00 to 14.50
Railroad malleable	16.00 to 16.50
Light bundled sheet scrap	10.50 to 11.00

The following prices are per net ton, f.o.b. Cleveland:

Iron car axles	\$21.00 to \$21.50
Cast borings	8.25 to 8.50
Iron and steel turnings and drillings	9.00 to 9.50
Steel axle turnings	11.00 to 11.50
No. 1 busheling	13.00 to 13.50
No. 1 railroad wrought	15.00 to 15.50
No. 3 cast	14.25 to 14.75
Stove plate	12.00 to 12.50
Bundled tin scrap	11.00 to 11.50

Cincinnati.

CINCINNATI, OHIO, March 2, 1910.

March opens in finished lines with a feeling of assurance. Building enterprises that have been slumbering for several weeks are going ahead, and jobbers all report business on the up grade. In pig iron not so much can be said, and there is no appreciable increase of interest by either buyer or seller; in fact, it is a waiting game, with chances favoring a sudden turn shortly. Old material displays continued weakness; large consumers are not open to negotiations, but dealers in scrap are quietly increasing their already heavy stocks. Some restriction of the coke output is reported in both Connellsville and West Virginia fields, but specifications on contract are good.

Pig Iron.—Continued indifference on the part of consumers and no sign from the furnace interests constitute a condition of uncertainty in the pig iron market somewhat difficult to analyze. Such business as is going now is for quick shipment for immediate requirements, and this business, which is almost entirely of small lots, is mainly analysis or special irons. The Southern market on foundry iron is rather firmly fixed at \$13.50, Birmingham, for the remainder of the first half, and the price of \$13, so frequently heard, is an echo of the warrant iron of last week, which has not yet apparently been exhausted. A few of the Southern interests will sell at \$13.50 over the remainder of the year, and \$13.75 is also heard in this connection for standard Alabama iron, but a number of the Southern interests, realizing the situation, which rather strongly assures a heavy buying for the last half within a few weeks, stand firmly at \$14. There is an inquiry from southern Indiana for some Southern foundry running 5 to 6 per cent. in silicon. A stove maker in Ohio is figuring on 1700 tons of iron running 4 to 5 per cent. in silicon, which will be negotiated by the St. Louis headquarters of the concern. The largest steam pump interest is buying to-day 1800 tons, 2 per cent. and over in silicon, and 350 tons of 6 to 8 per cent., for shipment to the Cincinnati plant, and it is quite certain that the largest pipe interest is buying quietly all the low grade iron it can obtain at the prices, which are figured approximately at \$12.75, Birmingham, for forge. The St. Louis users of basic, who have been shopping around for a week or 10 days, have, it is understood, bought a modest tonnage of local iron and will defer any further purchase for a time. It is reported that these buyers are fixing as their maximum \$18.50, delivered, St. Louis. The Northern foundry situation is unchanged and \$17 remains the quoted price for any delivery over the remainder of the year, although it is quite certain that \$16.50 could be done on a fair sized tonnage for shipment prior to July 1. There is some inquiry for ferrosilicon. A sale of 50 per cent. covering the requirements of a large user for the remainder of the year, was made at \$62.50, Niagara Falls. In small lots the price is \$63. There is so little sale of Ohio silveries that it is difficult to get a price, but it is rather certain that \$20.20, Cincinnati, can be done for the remainder of the first half. For prompt shipment and remainder of the first half, based on freight rates of \$3.25 from Birmingham and \$1.20 from Ironton, we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 foundry	\$17.25 to \$17.75
Southern coke, No. 2 foundry	16.75 to 17.25
Southern coke, No. 3 foundry	16.25 to 16.75
Southern coke, No. 4 foundry	16.00
Southern coke, No. 1 soft	17.75
Southern coke, No. 2 soft	17.25
Southern gray forge	15.75
Ohio silvery, 8 per cent. silicon	20.20
Lake Superior coke, No. 1	18.70
Lake Superior coke, No. 2	18.20
Lake Superior coke, No. 3	17.70
Standard Southern car wheel	24.75 to 25.25
Lake Superior car wheel	21.75 to 22.25

(By Mail.)

Coke.—The close of the month finds a little more life in the coke situation, as possibilities of April 1 renewals of con-

tracts seem imminent. While there are some brands of Connellsville furnace grades selling at around \$1.75 per net ton, at oven, the best that can be done on standard cokes on spot business is about \$2, and on forward deliveries \$2.25 to \$2.50. A number of large contracts for furnace coke made last year when the price was especially attractive will expire in April, May and June, and renewals of this business will be in competition soon. This is especially true of foundry requirements. Connellsville foundry grades are quotable all the way from \$2.65 to \$3.25, at oven, for prompt delivery and \$2.75 to \$3.25 on contract. Wise County furnace coke is obtainable at about the same prices, standard brands for prompt shipment bringing \$2 to \$2.10. Pocahontas foundry is pretty well sold up and is quotable at \$2.50 for spot shipment.

Finished Iron and Steel.—Warehouse business continues good, and the sales agencies report conditions unchanged, save that deliveries have improved materially. The L. Schreiber & Sons Company reports having secured the contract for the ornamental work in the new municipal building of New York City, amounting to about \$100,000. For the new plant of the Cincinnati-Bickford Tool Company in Oakley approximately 1000 tons of steel shapes will be required, and bids were required to be in Philadelphia February 22. The award will be made here. For the new foundry additions of the Laidlaw-Dunn-Gordon plant, for which about 650 tons will be required, the McClintic-Marshall Construction Company was the successful bidder, as also for the additional steel required, something like 500 tons, for the enlarged Ohio Mechanics Institute auditorium. The Union Iron Works Company has secured the steel for the addition to the Hotel Munro, about 100 tons. The extension to the Cincinnati *Times-Star* Building will require about 350 tons, Harig & Co., contractors. Sheets are a little quiet and deliveries, which for a time were delayed for six to eight weeks, are now practically prompt. Local makers are looking for a gradual increase in new business and specifications after March 1. Weather conditions have retarded outdoor work. There is no change in prices. A good business is going in both steel and iron bars. No prices are available yet for second half deliveries.

Old Material.—Conditions in this trade show no improvement; in fact, the market is weaker. One local concern has had a man in the South investigating conditions; his report indicates that the prevalent weakening in prices is more apparent in that territory than the North. Mills are specifying on their contracts for melting steel, but are not making new contracts, and prices seem to have no interest to them. A price is obtainable on some items, but on others the absence of any business makes quoting difficult. The following quotations therefore are nominal, being as nearly indicative of the market as it is possible to get them, and are f.o.b. Cincinnati and southern Ohio yards:

No. 1 railroad wrought, net ton.....	\$13.50 to \$14.00
Cast borings, net ton.....	7.50 to 8.00
Heavy melting steel scrap, gross ton.....	14.00 to 14.50
Steel turnings, net ton.....	9.00 to 9.50
No. 1 cast scrap, net ton.....	12.50 to 13.00
Burnt scrap, net ton.....	9.00 to 10.00
Old iron axles, net ton.....	18.00 to 18.50
Old iron rails, gross ton.....	17.50 to 18.00
Old steel rails, short, gross ton.....	15.00 to 15.50
Old steel rails, long, gross ton.....	16.00 to 16.50
Relaying rails, 56 lb. and up, gross ton.....	23.00 to 24.00
Old car wheels, gross ton.....	14.50 to 15.00
Low phosphorus scrap, gross ton.....	17.00 to 17.50

Members of the W. F. Potthoff Company, contractor for structural work in steel and iron, Cincinnati, have organized a company under the title of the Potthoff Construction Company, with W. F. Potthoff, president; A. E. Reuse, vice-president and manager, and L. C. Potthoff, secretary and treasurer. The new company will handle the concrete end of the business, which differs from the usual "reinforced," in that the basis or foundation of the process is known as "steel cage construction." The new company will supply the concrete portion of the Ohio Mechanics Institute Building.

Birmingham.

BIRMINGHAM, ALA., February 28, 1910.

Pig Iron.—The buying during the past week was mainly of the hand to mouth order, and the aggregate tonnage involved comparatively insignificant. No report has so far been made of sales at lower figures than a basis of \$13.50, Birmingham. This price is understood to be acceptable to all producing interests who are solicitous of additional orders, but with delivery limited to the first half. For strictly second half delivery, a basis of \$14 is considered the market price. An offer of \$13.50 for No. 2 foundry for delivery during the last half is reported as having been refused, but the demand for any delivery has for some weeks been of such a desultory nature that it is hardly probable round tonnage propositions have had serious consideration. The competition for such tonnage as is offered for early delivery is very keen and has of itself in some cases resulted in the purchase of smaller lots than were contemplated at the time

of inquiry. As was expected with the first decline, there is a disposition among melters to defer shipment of tonnage engaged at figures around the \$15 schedule, and in some cases where satisfactory arrangements with the furnace companies could not be made, the tonnage is being offered for resale. Such offerings, however, are in such a manner as not to affect the price asked by the producing interests. It is noted that with the smaller margin the merchant interests are not disposed to shade producers' prices to the extent that resulted when higher prices were asked, and with the inception of buying to any extent it is believed that the furnace prices would be maintained. It is reasonably certain that the trade generally did not provide for its requirements during the heavy buying of some months past to the extent indicated by the attitude of buyers, while a materially reduced output from the furnaces during the remainder of this year is now practically assured. A conservative estimate of the aggregate stock now on furnace yards does not indicate an increase over the accumulation shown February 1, and stocks on melters' yards have of necessity decreased by reason of difficulty experienced by shippers in securing railroad equipment.

Cast Iron Pipe.—The small orders placed during the past week with local concerns are of little volume and probably represent a slight decline in prices. The continued deferment of shipment against contracts in the Northwest by reason of unfavorable weather conditions is beginning to take form in accumulations on yards, although producers are inclined toward larger outputs in view of prospects for the spring months rather than curtail by reason of present conditions. No report is made of significant lettings to be held within the next 30 days other than has been mentioned previously. Authorized quotations on water pipe are unchanged, but it is quite probable that more extensive shading can now be done than at the time of last report. We quote as follows, per net ton, f.o.b. cars here: 4 to 6 in., \$25; 8 to 12 in., \$24; over 12 in., average \$23, with \$1 per ton extra for gas pipe.

Old Material.—The market is quiet and prices are probably weaker. Shipments against contracts as originally stipulated are being made, but buyers are not disposed to take hold for additional future deliveries. The offering to dealers is light, but no unusual effort is being made to accumulate stocks under existing conditions. We quote dealers' asking prices nominally as follows, per gross ton, f.o.b. cars here:

Old iron axles.....	\$19.50 to \$20.00
Old iron rails.....	15.50 to 16.00
Old steel axles.....	18.50 to 19.00
No. 1 railroad wrought.....	14.00 to 14.50
No. 2 railroad wrought.....	11.50 to 12.00
No. 1 country wrought.....	11.00 to 11.50
No. 2 country wrought.....	11.00 to 11.50
No. 1 machinery.....	12.50 to 13.00
No. 1 steel.....	11.75 to 12.25
Tram car wheels.....	12.00 to 12.50
Standard car wheels.....	14.00 to 14.50
Light cast and stove plate.....	10.00 to 10.50

The furnace of the Georgia-Alabama Iron Company at Cedartown, Ga., has been blown in on charcoal iron.

Work has been commenced on the foundation for the new plant of the American Steel & Wire Company at Ensley, Ala.

J. B. McClary & Co. have opened an office in room 1152 Brown-Marx Building, Birmingham, Ala., as sales agents for railroad, mill, mine and furnace supplies. They are agents for the Stokes Wood Preserver Company's Locustine.

St. Louis.

ST. LOUIS, February 28, 1910.

Barring a disposition on the part of men connected with the building trades to engage in a controversy with contractors on the question of higher wages, business conditions in St. Louis are normal for the season, and in most lines there is a better volume of trade than at the corresponding time last year. In March and April the payment of over \$3,000,000 in dividends by companies whose securities are listed here will act as a stimulus to business. The assessed value of property for taxes in St. Louis shows an appreciation of \$31,050,000 for 1910 over the assessment of last year. There is a better feeling in the pig iron trade, but scrap iron and steel rule dull and lower. Coke also is easier. The Missouri, Kansas & Texas Railroad has ordered 2500 new freight cars and 65 locomotives, and the Missouri Pacific 60 locomotives.

Coke.—Generally speaking, the coke market is lower, but the higher grades and standard brands, while easier, are not offered at less money, though a concession might be secured on a firm offer, as the market is in buyers' favor. Crushed sizes are not readily obtainable. Occasionally a premium is paid for foundry coke held on track, St. Louis, by parties in urgent want, whose supplies are not coming forward promptly. There are no large inquiries out and the demand is of quite moderate proportions. We quote standard 72-hour foundry for prompt shipment, \$2.80; for de-

livery over the year, \$3 per net ton, f.o.b. oven, Connells-ville district.

Pig Iron.—Most of the leading sales agencies are inclined to believe that a turn for the better in the demand and possibly in the price of pig iron is at hand. In fact there was more inquiry than for two or three weeks past. The sale is reported of 5000 tons of Northern basic to a local steel foundry for shipment over the last half, also the following inquiries: 1700 tons of 4 to 5 per cent. silicon, for shipment over the last half, and two lots of 1500 tons each of Southern foundry. There is in addition a fair demand for small lots. There seems to be some irregularity in prices, due to competition between furnacemen on the one hand and speculative offerings on the other. It is also evident that in some cases furnaces are not inclined to compete for new business at present, feeling that it is likely better market conditions will obtain later on. Large buyers, on the contrary, incline to the idea that possibly last spring's course of the market may be witnessed and are holding off. There appear to be, however, indications of a better demand from railroads in the near future, which tends to help the tone of value. Referring again to occasional offerings, with concessions and sales made on acceptance of firm offers, we quote Standard No. 2 foundry for prompt shipment at \$13.50; for shipment over the last half of the year, \$14, Birmingham basis. Southern Ohio is quoted at \$17, f.o.b. furnace.

Lead, Spelter, Etc.—Lead is ruling quiet and is offered at 4.42½c. to 4.45c. Spelter is in a little better demand, quoted 5.55c., East St. Louis basis. Zinc ore is quiet; price ranging from \$39 to \$41 per ton, Joplin base. Tin is up 5c. per 100 lb.; antimony unchanged; copper unchanged. The demand for finished metals is a little uneven, being good the first of the week and quiet at the close.

Old Material.—With no business doing, except that passing between dealers, mostly covering short sales, there has been some decline in prices during the week. The weakness in pig iron and the dull trade in that market have some effect on the scrap market. There are no offerings by the railroads reported for the week. Dealers look for more favorable conditions to prevail next month. We quote dealers' prices as follows, per gross ton, f.o.b. St. Louis:

Old iron rails.....	\$15.50 to \$16.00
Old steel rails, rerolling.....	15.00 to 15.50
Old steel rails, less than 3 ft.....	14.00 to 14.50
Relaying rails, standard sections, subject to inspection.....	26.00 to 26.50
Old car wheels.....	16.00 to 16.50
Heavy melting steel scrap.....	14.00 to 14.50
Frogs, switches and guards, cut apart.....	14.00 to 14.50

The following quotations are per net ton:

Iron fish plates.....	\$14.50 to \$15.00
Iron car axles.....	20.50 to 21.00
Steel car axles.....	19.50 to 20.00
No. 1 railroad wrought.....	14.00 to 14.50
No. 2 railroad wrought.....	13.00 to 13.50
Railway springs.....	12.50 to 13.00
Locomotive tires, smooth.....	16.50 to 17.00
No. 1 dealers' forge.....	11.00 to 11.50
Mixed borings.....	7.00 to 7.50
No. 1 busheling.....	12.00 to 12.50
No. 1 boilers, cut to sheets and rings.....	10.50 to 11.00
No. 1 cast scrap.....	13.00 to 13.50
Stove plate and light cast scrap.....	9.50 to 10.00
Railroad malleable.....	12.00 to 12.50
Agricultural malleable.....	9.75 to 10.25
Pipes and flues.....	10.50 to 11.00
Railroad sheet and tank scrap.....	9.00 to 9.50
Railroad grate bars.....	10.50 to 11.00
Machine shop turnings.....	10.50 to 11.00

The Lake Gas System Mfg. Company, St. Joseph, Mo., has been incorporated; capital stock, \$20,000; incorporators: L. B. Lake, C. F. Strop and Herman Reinke.

The Rock Island Railroad Company has completed plans for a mammoth independent terminal system in North St. Louis, covering 38 acres, and will spend upward of \$3,000,000 in freight and passenger improvements. An appropriation of approximately \$4,000,000 has also been made for the reconstruction and shortening of the St. Louis & Kansas City line of the system.

The Busch-Everett Company, which is to build a natural gas line from the Caddo fields of Louisiana and Arkansas, will arrange for laying a 20-in. pipe line. The length of the conduit from the wells to the center of distribution will vary from 442 to 500 miles. It is estimated that the cost of the main and condensing stations, 100 miles apart, right of way and labor will not exceed \$25,000 per mile. The Laclede Gas Light Company will act as distributor and merchant. The Busch-Everett Company will act as purveyor and carrier.

The Government plans to build two light steamers of new design for the Mississippi River. One will be an inspection boat for the dredge service; the other is to be a tender for the lighthouse service in this district.

Chicago advices report that the net earnings of the Inland Steel Company in 1909 were about \$900,000, an increase of \$250,000. The company's plants are running at full capacity.

San Francisco.

SAN FRANCISCO, February 23, 1910.

This market is still rather quiet in most lines of finished products, purchasing interests being inclined to await further developments before entering the market on a large scale. Some improvement, however, is noted over the condition of the last two months, and it is now fairly certain that February bookings in all departments will materially exceed those of January. The increasing tonnage, however, is confined almost entirely to the jobbing trade, as purchases are confined to requirements of the near future, drawing upon the large stocks in local stores. Mill representatives report a comparatively light tonnage in most departments, and it is becoming apparent that the movement in this direction from domestic mills will probably be smaller for the year than was at first estimated. In view of increased inquiry from consumers and the slight reduction in stocks which has already taken place, merchants are placing a few orders of a sorting-up nature. Manufacturing interests show no anxiety over the local situation, owing to the difficulty of making prompt deliveries of most materials. A heavy tonnage of foreign material is due to arrive during the spring, but as far as can be learned few new orders are being placed with foreign mills. Considerable domestic steel is now coming via Cape Horn in sailing vessels, reducing the expense but increasing the time required for transportation. On foreign material laid down in San Francisco, importers are quoting 1.90c. to 1.95c. for bars, and 2.12c. for plates.

Rails.—Plans for new construction on the smaller railroads in this territory are beginning to take definite shape, and numerous inquiries of some importance, but so far of a more or less tentative nature, are now coming into the market. Several large projects are under way in the North, and it is expected that work will soon be started on a road in Nevada. The movement at the moment is not large, but an increasing tonnage is expected during the spring. The jobbing market for light rails is quiet and some of the local merchants are carrying heavy stocks, though the movement from Western mills is of fair proportions.

Bars.—The jobbing movement, while still by no means active, is gradually increasing. Buyers do not yet show any inclination to anticipate their season's requirements, but current needs now aggregate a fair tonnage and bookings for delivery from store are well ahead of the same period last year. In view of delayed deliveries from the mills, jobbers anticipate heavier demands on local stocks than usual during the summer. Supplies in some sizes are already diminishing, and a few orders are being placed with the mills on this account, though the movement from mill to merchant is still on a small scale and no immediate increase is expected. Inquiries are fairly large, however, for twisted bars for concrete reinforcement. Foreign bars are still arriving freely, but owing partly to advancing prices on foreign material and partly to the heavy supplies already on hand, few additional orders are being placed. Bars from store, San Francisco, are firmly held at 2.50c. for steel and 2.30c. for iron.

Structural Material.—Local contracts for fabrication this month have been almost entirely limited to small projects, most of which were taken by the smaller local shops. The total tonnage has been rather below the average of the last three years. Business has also been rather quiet in other Coast cities. The dullness here is due to the fact that the figures submitted on a number of large buildings, which were to have been awarded this month, exceeded the money available, and some alteration will be made in the plans before new figures are taken. A contract will shortly be let for the west wing of the Southern Pacific Hospital, to cost about \$150,000. The Western Iron Works has taken a contract for about 150 tons for the Saper Building on Sutter street. The general contract for the Yeon Building in Portland, Ore., has been let to the Thompson-Starrett Company, and the fabricating order is expected within a few weeks. The Central Iron Works has a small contract for a building at Bush and Kearny streets. The steel contract for the Bankers' Hotel in Oakland is still withheld, as are those for the Olympic Club and the Native Sons' Hall. The Western Iron Works has taken a small contract for a building on Minna street. The final contract for the municipal pumping station at Second and Townsend streets is expected early next month. A small job is in prospect for a bank building in Alameda, Cal., and plans are being made for a six story steel building for H. C. Capwell in Oakland. It is reported that plans are being prepared in New York for the new Morris theater in this city, but little information is available here. A project has been started to build a large auditorium, covering a city block, at Van Ness avenue and Grove street, but so far nothing has been done on the plans. In a recent report to the Board of Public Works, it was shown that \$138,754,622 had been expended for new buildings here since the fire. The number of Class A buildings erected in that period is given as 96; Class B, 1115; Class C, 1585. Beams and channels, 3 to 15 in., are quoted at 2.70c., from store, San Francisco.

Pig Iron.—Local foundries are operating on a small scale at present, with no large inquiry for castings in any line. Structural and ornamental castings are seasonably dull, though a heavy tonnage is expected in this department during the second quarter. Some work is being done on pumping machinery by local firms, and the gas engine factories are fairly busy, but the tonnage used for these purposes is light, and general machinery castings are quiet. Foundries are accordingly keeping out of the market for pig iron. There have been no large arrivals here this month, and the movement from warehouse is extremely small, though some shipments are being made to other parts of the Coast. Prices are well maintained on spot offerings of foreign iron, quotations being \$24 to \$24.50 for Continental, \$24.50 to \$25 for English, and \$25 to \$25.50 for Chinese. Southern foundry iron is weak, being nominally valued at \$24.50.

Cast Iron Pipe.—Conditions are fairly encouraging for spring business in cast iron pipe, and the tonnage is steadily increasing. Several fair orders for municipal work have been taken this month, in addition to small lots for the current needs of water and gas companies, and the municipal projects now in sight promise a considerably larger tonnage. Bids are to be taken this week for installing a division of the Seattle, Wash., water system, and for a number of new mains in Tacoma, Wash. Several extensions have been ordered for the water system at Dinuba, Cal. It is stated that the reorganized Portland Gas Company, Portland, Ore., is planning to spend about \$2,500,000 in improvements, laying or replacing some 400 miles of gas pipe. An order for water pipe is expected shortly from Ashland, Ore., where certain extensions have been recommended. Prices are quoted at \$36 per net ton for 6 to 12 in.; \$37 for 4 in., and \$1 extra for gas pipe.

Merchant Pipe.—The situation in merchant pipe is by no means satisfactory. A fair tonnage is being booked for delivery to the oil fields, but there are no large bookings of line pipe at present, and orders from that quarter are expected to be of moderate proportions for the next month or two. Deliveries are being made promptly in this department and there is little disposition to order in advance of requirements. The local jobbing trade on the smaller sizes is gradually improving, but is still quiet in comparison with conditions last fall. Jobbers are liberally supplied, and aside from a few sorting-up orders are placing no new business with the mills. The movement from the mills will probably exceed that of last February, but the volume at that time was extremely unsatisfactory. Bids are to be taken March 7 for a fair tonnage of merchant pipe to be used in waterworks at Madera, Cal., and San Jose, Cal. Prices are well maintained locally, though it is reported that some concessions are occasionally granted on fittings.

Old Material.—Most lines of old material are still rather quiet, though there is a considerable movement of steel melting scrap, largely for shipment East. Cast scrap is moving on about the same scale as before, the immediate demand being moderate, though prices are quite firmly held. Values remain fairly strong on all descriptions, cast scrap being quoted at \$18 to \$19 per gross ton; steel melting scrap, \$11 per gross ton; railroad wrought scrap, \$13 per net ton; rerolling rails, \$12 per net ton.

The American Steel Casting Company has been incorporated in San Francisco, with a capital stock of \$100,000, by J. S. Lamson, S. Hendricks, A. C. Hastings, W. Dorn and E. Williams.

The Tay-Pike Company has been incorporated in San Francisco with a capital stock of \$100,000 by Edw. H. Kinney, Francis J. Baker, P. E. Mack, T. H. and P. M. Pike. Messrs. Kinney and Baker are connected with the Geo. H. Tay Company, dealer in pipe, &c., and the new firm will engage in the oil well supply business.

The Southern Pacific Company has completed plans for two steel ferryboats for service on San Francisco Bay, to be used in connection with its suburban electric railroad system.

The Crane Company has purchased a lot at Ninth and Webster streets, Oakland, on which it will shortly erect a building. The Pacific Hardware & Steel Company has also purchased a site in Oakland.

It is reported in Sacramento that the Southern Pacific Company is making plans to erect a steel plant at that place to work up its old material.

Waterhouse & Lester, dealers in vehicle hardware and merchant steel, are planning to erect a seven-story building at Sacramento, Cal.

The American Sheet & Tin Plate Company, Frick Building, Pittsburgh, has issued two cards which will be found of practical value to dealers in and users of black and galvanized sheets. They are of large size, each being 14 x 20 in., and are eyeletted for hanging on the wall. One refers to the company's Apollo Best

Bloom galvanized sheets and the other to black sheets. Each presents a table which gives separately, from 10 to 30 gauges, the weight per square foot in ounces and pounds and the weight of sheet, number of sheets and weight of bundle of each of the commercial sizes.

The German Iron Market.

BERLIN, February 17, 1910.

The reports from the iron market this week are slightly less satisfactory. It is mentioned that the upward tendency has become less uniform than it was, particularly in respect to bars, under which term the largest single class of products in the allotments of the Steel Syndicate is embraced. Buyers, it is reported, are calling less briskly for the delivery of bars on order, while dealers are offering them more freely, and in some cases apparently at lower prices than manufacturers are now asking. But that the bar market is still in a good shape is shown by the fact that the mills on the Saar, in Luxemburg and Lorraine, have just raised their prices by 4 marks for sales in South Germany.

In other sections of the market the upward tendency of prices continues. The wire combination several days ago raised the price of galvanized qualities by 5 marks. It also voted advances of 2.50 marks on some other kinds of wire, as well as on wire nails. The second quarter of the year was opened for contracts. It was given out at this meeting that the mills are unusually busy. The efforts to organize a syndicate covering wire nails were again unsuccessful. The sewer pipe manufacturers in the western part of the country have raised prices; how much is not mentioned. On the Düsseldorf Exchange which held its trading in iron products this week earlier than usual, prices were mostly unchanged, which is a new thing after the recent steady upward movement of the past few months. Wire rods of soft steel were quoted at 130 marks, comparing with the previous price of 127.50 marks. Steel making pig iron was quoted at 62 to 63 marks for the Rheinisch-Westphalian district, whereas it had not been quoted on the last trading day. The same quality was quoted at 59 to 60, against 60 to 63 marks, for the Siegerland region. This is the first case of a drop in prices on the Düsseldorf Exchange for a long time. It is another indication of a slight irregularity in the market position.

In reference to bars again, it may be mentioned that the combination did not mark up prices last week as had been expected, but a further meeting is called for next week, when it is expected that higher prices will be adopted. The Steel Syndicate is also to meet on the 24th, when it is believed that an advance on structural shapes will be made.

From the pig iron trade the news remains good, but probably the situation is slightly less buoyant than hitherto. Where iron can be ordered for immediate delivery from stocks on hand prices are a little easier, but for delivery during the second half year they are firmer. Belgium continues to buy pig on the lower Rhine and in Luxemburg, and the big mixed establishments are calling for supplementary quantities. In the ore market it is noted that the cheap, low grade ores of Lorraine and Luxemburg are in better demand, owing to the scarcity and dearness of foreign ores.

The position of steel material for further manufacture remains very strong. After the price advance recently mentioned in this correspondence consumers hurried forward with new orders for delivery during the June quarter. Works asking for supplementary quantities for the current quarter had also to pay the advance. The price situation for the export trade has become stronger. Belgium having led the upward movement, most orders are now coming to German mills. In general, the latter have orders booked that will keep them employed till the middle of the year. Consumers show a disposition to place orders for long terms, but the mills are holding them off for dates beyond July 1.

Business in heavy plates remains active. Shipyards are now sending in pretty good orders, and further business of that kind is in prospect. Prices are easily maintained in view of the firmness of the English market. Some of the mills are reported to be very busy on ship plates. The improvement in boiler plates makes slower progress, but there is progress, nevertheless. There is also work coming in on thinner qualities.

In steel rails home orders for the winter have been mostly worked off, and there is little or nothing coming in from that source. Many of the foreign orders are not for immediate delivery, but some orders from abroad for quick delivery are in sight, as well as still larger ones for longer terms.

Germany's exports of iron in all forms in January aggregated 339,578 metric tons, which compares with 262,470 tons in January, 1909. Imports amounted to 39,919 tons, against 33,630 tons.

According to a report from Bucharest, a group of German capitalists is arranging with the Russian Government to erect a great iron and steel works in that country. The

steel plant will embrace three 20-ton open hearth rail mills, bar and sheet rolls and workshops for the further process of manufacture are to be erected. Tubing of the Mannesmann system will also be made. Upper Silesian ironmen are about to establish a rolling mill for turning out seamless tubes at Freistadt, in Austrian Silesia.

Another big steel works is about to rise in connection with the Niederrheinische Hütte, in which Prince Donnersmarck, the Silesian iron magnate, acquired a controlling interest about two years ago. Up to that time the concern was a rather antiquated furnace company, but when he got possession he proceeded to rebuild the furnaces on strictly modern lines. It was chiefly his refusal to join the Pig Iron Syndicate toward the end of 1908 that disrupted that organization. This company now proposes to build equally modern steel works. It has already been mentioned in this correspondence that the great Gelsenkirchen Company had decided to erect a number of blast furnaces and a great steel mill near the French frontier. Several months ago the powerful coal firm, Thyssen & Co., one of the strongest concerns in the German coal and iron industry, began to build four furnaces, also near the French frontier, at Hagendingen and Mazières, and already it is announced that steel works are to be added. All this naturally means a big increase in the production of iron and steel in Germany within a few years. Foreign markets will doubtless hear more of this later on. Germany is clearly preparing to become a more dangerous competitor in outside markets.

Germany's foreign trade in iron ores shows some interesting changes since the year 1900. In that year the imports of foreign ores amounted to only 4,108,000 metric tons, but last year they reached 8,367,000 tons. On the other hand, the exports of ores dropped in that time from 3,248,000 tons to 2,825,000. A considerable part of these changes in both directions were due to the development of richer iron mines across the French frontier than those found in the adjacent Lorraine-Luxemburg region, though being in a common geological formation. In 1900 Germany exported to France 1,428,000 tons of ores, but last year only 868,000 tons was sent there. On the other hand, Germany's imports of ores from France, which amounted to only 66,000 tons in 1900, rose to 1,368,000 tons last year. In the same time imports from Sweden rose from 1,437,500 tons to 2,880,000 tons; from Spain, from 1,848,500 tons to 2,460,700 tons, and from Algiers from 154,500 tons to 223,300 tons. Nine years ago Germany imported only 862,000 tons more than it exported, but last year the import balance rose to 5,542,000 tons.

Iron and Industrial Stocks.

NEW YORK, March 2, 1910.

The stock market for the greater part of the past week was fairly firm, a brief interval of reaction occurring on Saturday and on Monday morning, prompted by some apprehension that the Supreme Court might hand down a decision in the American Tobacco case. As this failed to appear, a prompt recovery took place. The range of prices on active iron and industrial stocks from Thursday of last week to Tuesday of this week was as follows:

Allis-Chalm., com.....	12	Railway Spr., com.	41½ - 42½
Allis-Chalm., pref.	41 - 42	Republic, com.	37½ - 39½
Beth. Steel, com....	29½ - 31½	Republic, pref.	101½
Beth. Steel, pref.	59½ - 60½	South. I. & S., com.	20 - 20½
Can., com.....	11½ - 12½	Sloss, com.	75½ - 76½
Can., pref.	75½ - 77½	Sloss, pref.	116½ - 118
Car & Fdry., com.	62½ - 64	Pipe, com.	24 - 25½
Car & Fdry., pref.	117½	Pipe, pref.	77½
Steel Foundries....	61 - 62½	U. S. Steel, com.	79½ - 83½
Colorado Fuel....	38½ - 40	U. S. Steel, pref.	119½ - 120½
General Electric....	154 - 156	Westinghouse Elec.	70½ - 71
Gr. N. ore cert....	69 - 70½	Va. I. C. & C.	62½
Int. Harv., com....	87½ - 94½	Chi. Pneu. Tool....	44 - 47
Int. Harv., pref.	120 - 121½	Cambria Steel....	48½ - 49½
Int. Pump, com....	48	Lake Sup. Corp....	24 - 24½
Locomotive, com....	50 - 51½	Warwick, com.	11½
Locomotive, pref.	111½ - 111½	Crucible St., com.	17 - 15½
Pressed St., com....	42½ - 43½	Crucible St., pref.	87 - 88½
Pressed St., pref.	102	Harb.-W. Ref., pref.	94

Last transactions up to 1 p.m. to-day are reported at the following prices: United States Steel common 84½, preferred 120%, bonds 105½; Car & Foundry common 64½, preferred 118½; Locomotive common 52½, preferred 112; Colorado Fuel 41; Pressed Steel common 44, preferred 102; Railway Spring common 43½; Republic common 40½, preferred 102½; Sloss-Sheffield common 75½; Cast Iron Pipe common 26%, preferred 77½; Can common 12½, preferred 77½.

On August 1, 1910, \$6,000,000 collateral trust notes of the Westinghouse Electric & Mfg. Company will fall due. It is stated that arrangements have already been made to take care of the notes when they will fall due.

The Lackawanna Steel Company announced last week that its \$15,000,000 5 per cent. gold notes, due March 1, together with the coupon, would be paid on that date at the office of Speyer & Co., New York, who had offered to accept on or before March 1 a limited amount of these notes at par ex. the March 1 coupon, in exchange for new Lacka-

wanna Steel Company five-year 5 per cent. gold debentures at 95½. The debenture issue is limited to \$10,000,000. They mature March 1, 1915.

Net earnings of the subsidiary companies of the American Brass Company for the fiscal year ended December 31 last were \$1,767,546, an increase of \$730,028, or 70 per cent., over the previous year. Their surplus December 31 was \$11,433,587, against \$10,741,521 a year previously. The American Brass Company owns the entire capital stock of the Ansonia Brass & Copper Company, Benedict & Burnham Mfg. Company, Coe Brass Company and Waterbury Brass Mfg. Company. Through its subsidiaries it owns the Ansonia Land & Water Power Company, Birmingham Brass Company, Chicago Brass Company and Waterbury Brass Goods Corporation.

The American Car & Foundry Company has declared a quarterly dividend of 1½ per cent. on the preferred stock and ½ per cent. on the common stock, both payable April 1.

Announcement is made that the Midvale Steel Company, Philadelphia, Pa., will increase its capital stock from \$750,000 to \$9,750,000. The additional stock will be issued to the present stockholders as a dividend. It represents the capitalization of part of the undivided profits since the Midvale Steel Company was organized in 1890, and which on October 31 last, the close of the company's fiscal year, aggregated \$11,665,812.

The profits of the Wheeling Steel & Iron Company, Wheeling, W. Va., in 1909 were \$1,118,189.44, being the largest in any one year in its history. The surplus at the close of the fiscal year was \$2,320,237.35. The earnings of the company for the year 1909 were 20 per cent. more than its capital stock.

Dividends.—The La Belle Iron Works, Steubenville, Ohio, has declared a quarterly dividend of 2½ per cent., payable March 31. This is an increase from an 8 to a 10 per cent. annual basis.

At a meeting last week of the directors of the Chicago Pneumatic Tool Company a resolution was passed that it was the opinion of the directors that on March 22 a quarterly dividend of 1 per cent. should be declared, payable April 25. In 1907 dividends which had been at the rate of 4 per cent. per annum were passed.

The Railway Steel Spring Company has declared the regular quarterly dividend of 1¾ per cent. on the preferred stock, payable March 21.

The Cambria Iron Company has declared a semiannual dividend of 2 per cent., payable March 15.

The International Harvester Company has declared a quarterly dividend of 1 per cent. on the common stock, payable April 18.

The American Brake Shoe & Foundry Company has declared the regular quarterly dividend of 1½ per cent. on the preferred stock and 1¼ per cent. on the common stock, and in addition an extra dividend of ½ of 1 per cent., both dividends payable March 31.

Correction.—We are advised by the Standard Connecting Rod Company, Beaver Falls, Pa., that the statement printed in *The Iron Age* of February 24, on page 484, that the Union Drawn Steel Company recently took over the Standard Connecting Rod Company is incorrect. We regret the error and trust that no ill effect will be experienced by the Standard Connecting Rod Company by reason of the publication of the statement referred to, which came from a source considered thoroughly reliable. In this case it appears that a serious mistake was made. We are further assured that there is no connection whatever between the Union Drawn Steel Company and the Standard Gauge Steel Company at Beaver Falls, the two concerns being entirely separate and distinct.

The Engineers' Society of Western Pennsylvania.—The regular monthly meeting of the Engineers' Society of Western Pennsylvania was held in the society rooms, Fulton Building, Pittsburgh, February 15. Elmer K. Hiles was re-elected secretary. A paper on "The Government Testing Station in Pittsburgh" was presented by J. C. Roberts, assistant chief engineer, Technologic Branch, United States Geological Survey. A very illuminating description of the work accomplished, as well as that to be taken up in connection with the testing of structural materials and fuels and the causes and prevention of mine accidents, was given.

New York.

NEW YORK, March 2, 1910.

Pig Iron.—The placing of orders for about 9000 tons of Northern foundry iron by one large machinery interest is the feature of the week. Some low prices developed, a good portion of the iron being for early delivery. Eastern Pennsylvania and New Jersey furnaces took the greater portion of this business, and as low as \$18 at New Jersey foundry is reported in this connection. It is understood that the same interest will buy 5000 to 6000 tons for its foundries in southern Ohio and eastern Massachusetts. It is expected that a contract will be closed this week by another machinery foundry in New Jersey for 6000 tons. General business has been slightly better this week, several lots of 500 tons having been sold. Virginia irons are not so much in evidence, but quotations have been made of \$15 at furnace for No. 2 iron, as against a recent minimum of \$15.25. Radiator and electrical foundries are in the market for additional iron. In general little interest is shown in buying for the last half of the year. It is admitted that some of the offers recently made by producers are attractive, but buyers prefer to have assurance of the definite touching of bottom, even if they must buy on the ensuing ascent. We quote Northern iron at tidewater as follows for first quarter: No. 1, \$18.75 to \$19; No. 2 X, \$18.50; No. 2 plain, \$18.25. For early delivery Southern iron is quoted at \$18.25 to \$18.75 for No. 1 and \$17.75 to \$18 for No. 2.

Steel Rails.—The distribution of the Southern Railway order has not been definitely announced, but it is expected that the greater part of the 60,000 tons will be taken by the mills at Ensley and Sparrows Point. The Lackawanna Railroad is in the market for 45,000 pairs of angle bars. The recent decision of important interests to go ahead with further construction on the Alaska copper district railroad brought an order for 10,000 tons of rails. Several good orders for track supplies have been placed lately and more business of this sort is pending. In the past week orders for about 17,000 tons of rails were taken by the Illinois Steel Company. The failure of the firm which had undertaken the financing of the Delaware & Eastern Railway takes the long pending rail inquiry of that company off the market.

Finished Iron and Steel.—February's business in all lines was good. Some fabricators ran considerably ahead of January; others did slightly less business, as the total tonnage of the contracts closed in February was under that of January, but it is to be remembered that it was a short month with two holidays, leaving only 22 working days. With allowance for that fact the last month was at least on a par with January. This applies also in the plate and steel bar trades. In iron bars more business was done than in the previous month and February ended very active. One mill reported it the best month in a year and a half. Orders and inquiries are coming in heavily for spikes, track bolts, rivets, &c., and with the increasing activity in building and railroad work in sight, March promises to be a very busy month. The Eastern Steel Company was one of those reporting an increased tonnage. It has taken the order through the Pennsylvania Steel Company for 11,000 to 12,000 tons of steel for the municipal building in New York City. The Pennsylvania Steel Company will itself roll the lighter sections, making up the remainder of the 25,000 tons which will be required for this building. The Eastern Steel Company also has the 800 tons of steel for the Kilburn textile mill at New Bedford, Mass., for which the J. J. Pridiville Company, South Framingham, Mass., is the general contractor, and the steel for a warehouse at Brockton, Mass., about 700 tons, will probably also be furnished by the Eastern Steel Company. Another textile mill, one at Lawrence, Mass., requires 600 tons of steel, which will be furnished by the American Bridge Company. The latter also has the Bessemer & Lake Erie Railroad's order for 1100 tons of material for a bridge at Conneaut, Ohio. The Hudson & Manhattan Railroad Company has placed an order for 870 tons for its car barns at Jersey City with the Riter-Conley Mfg. Company. Bids have been received on the following bridge work: For the Chicago, Hamilton & Dayton Railroad, 2500 tons; for the Atlantic Coast Line, 2500 tons, and for the Cleveland, Cincinnati, Chicago & St. Louis Railway 600 tons. The Great Northern Railway is inquiring for 2000 tons of bridge material. Among building material contracts still to be awarded are 1000 tons for the Power & Mining Machinery Company, Cudahy, Wis.; 800 tons for Lincoln Hall of the Chicago University, 500 tons for a courthouse in Montana, and 600 tons for an extension of the Girard Iron Works, Girard, Ohio. The bids are in on the steel for two contracts for the New York State Barge Canal, Nos. 49 and 75, requiring 750 tons of structural steel. The general contract for the Yeon Building, Portland, Ore., has been awarded to the Thompson-Starrett Company, and the latter is now taking bids on the 2000 tons of steel that will be needed. Prices remain unchanged and are quoted at New York as follows: Plain structural material, 1.71c., with a minimum

of 1.66c. on very desirable orders; plates, 1.71c.; steel bars, 1.66c., and bar iron at 1.70c. to 1.75c.

Cast Iron Pipe.—The activity noted in last week's report has not been well sustained. Quite a number of inquiries are in the market for private water and gas companies, but they are fewer, and the quantities named are smaller. The city of Boston will open bids March 8 for about 2350 tons of water pipe. As stated last week, the Department of Water Supply of the city of New York opens bids to-day for 6500 tons. Prices are well sustained at \$25.50 to \$26 per net ton, tidewater, for carload lots of 6-in.

Old Material.—No improvement is observed in this branch of trade, consumers continuing to display little or no interest. In the absence of business the following quotations, which are per gross ton, New York and vicinity, are nominal:

Rerolling rails		\$14.50 to \$15.00
Old girder and T rails for melting		14.00 to 14.50
Heavy melting steel scrap		14.00 to 14.50
Relaying rails		20.50 to 21.00
Standard hammered iron car axles		23.50 to 24.00
Old steel car axles		19.00 to 19.50
No. 1 railroad wrought		16.00 to 16.50
Wrought iron track scrap		14.00 to 14.50
No. 1 yard wrought, long		14.00 to 14.50
No. 1 yard wrought, short		13.50 to 14.00
Light iron		8.00 to 8.50
Cast borings		9.00 to 9.50
Wrought turnings		10.50 to 11.00
Wrought pipe		13.50 to 14.00
Old car wheels		14.25 to 14.75
No. 1 heavy cast, broken up		14.00 to 14.50
Stove plate		11.00 to 11.50
Locomotive grate bars		11.00 to 11.50
Malleable cast		15.50 to 16.00

John E. Thompson, the surviving partner of John W. Quincy & Co., 81 Fulton street, New York, announces that the partnership existing under this firm name has been dissolved, owing to the death of A. Digby Bonnell, and that he will continue the business of selling pig iron and allied products on his own account.

Metal Market.

NEW YORK, March 2, 1910.

THE WEEK'S PRICES.

	Copper.		Lead.		Spelter.		
	Lake	Electro-	Tin	New York	St. Louis	New York	
Feb.							
24	13.75	13.37½	33.15	4.57½	4.42½	5.70	5.55
25	13.75	13.37½	33.15	4.57½	4.42½	5.70	5.55
26	13.75	13.37½	..	4.60	4.45	5.70	5.55
28	13.75	13.37½	32.75	4.60	4.45	5.75	5.60
March							
1	13.75	13.37½	32.60	4.62½	4.47½	5.75	5.60
2	13.75	13.37½	32.87½	4.65	4.50	5.75	5.60

Increased buying and better prices sum up the metal market briefly. About 25,000,000 lb. of copper has been bought during the week; the tin statistics for February were encouraging; the price of lead is moving upward, and spelter is regaining ground. The heavy demand for tin plate continues.

Copper.—Copper is in decidedly better demand, although prices have not improved since our last report. About 25,000,000 lb. of copper was bought during the week, much of which will go into domestic consumption. There are reports of large sales to big consumers of copper which seem to be somewhat exaggerated, but small manufacturers are replenishing their stocks. It is apparent that the uncertainty that has prevailed in the copper trade of late has kept many consumers out of the market, and consequently manufacturers have let their stocks run down. Prices have hardened somewhat, but have not responded materially to the buying movement, except in the London market, which has gone up 10s. in two days. The exports of copper so far this month have been 24,794 tons. According to the report of the New York Metal Exchange, exports for the two months of this year held good and show an increase of 18,417 tons, as compared with the same period of last year. We quote electrolytic at 13.37½c. and lake copper at 13.75c., although some sellers of lake are holding out for 13.87½c. There were some good sales of copper in London to-day, amounting in all to 600 tons of spot and 1000 tons of futures. Spot copper sold for £60 5s. and futures £61 2s. 6d.

Pig Tin.—The February pig tin statistics were quite encouraging. Deliveries were better than expected and the supply of tin in New York has increased. Actual business is dull, but there are promises of a better demand, and, considering that February was a short month, the following extra from the monthly report of C. Mayer, secretary of the New York Metal Exchange, would seem to indicate that buyers will find it advisable to come into the market: "Deliveries into consumption during February were 3600 tons. The total for two months shows an increase of 1200 tons, compared with last year. The combined deliveries of London and Holland for February were 202 tons larger

than last year. Shipments from the Straits for February were 38 tons larger than for the same month of last year. Australia shipped 100 tons more in February compared with the same month of last year. The total visible supply February 28 was 542 tons above that of February 28, 1909." Spot tin brought 32.87½c. in the New York market this afternoon. In London spot tin was sold to-day at £149 7s. 6d. and futures £151. The sales were 250 tons of spot and 400 tons of futures.

Tin Plates.—The tin plate situation is unchanged from last week. Foreign tin plates are nearly as scarce as the domestic product, although the price of Swansea plates has not advanced further and is still 13s. 4½d. The leading interest continues to ask \$3.84 for 100-lb. coke plates.

Lead.—Lead shows a decided improvement, prices having been moving upward all the week. There is less pressure to sell and it is apparent that most of the outside offerings have been taken up. A few lots have been offered here and there at some shading under the daily price quoted above, but these shadings, so to speak, have from day to day followed the steady advance. It appears now that the large sellers of lead control the situation and their plan to keep the market up until the spring buying commences seems to have prevailed. To-day lead was bringing 4.65c. in New York and 4.50c. in St. Louis, which is an advance of 10 points over this time last week.

Selter.—There has been some buying of selter on the part of consumers, who are anxious to take advantage of the low price of last week, and this has had the effect of sending the market upward at least five points since Monday. Selter can be bought in New York at present for 5.75c., although some who have the metal to sell are demanding 5.80c. The St. Louis market, which went off badly when the metal showed a weakness, has regained its equilibrium and is following the upward trend. There seems to be more faith in the future than was current two weeks ago.

Antimony.—While a large part of the offerings of outside grades of the cheaper antimony have been taken up Hungarian antimony can still be had at 7.50c. The demand for the better known grades is stronger and prices are firmer. Hallett's is 8.25c. and Cookson's 8.50c.

Old Metals.—The market is quiet. Dealers' selling prices are unchanged, as follows:

	Cents.
Copper, heavy cut and crucible.....	13.00 to 13.25
Copper, heavy and wire.....	12.50 to 12.75
Copper, light and bottoms.....	11.75 to 12.00
Brass, heavy.....	9.50 to 9.75
Brass, light.....	7.75 to 8.00
Heavy machine composition.....	11.75 to 12.00
Clean brass turnings.....	8.00 to 8.75
Composition turnings.....	10.25 to 10.50
Lead, heavy.....	4.40 to 4.50
Lead, tea.....	4.05 to 4.15
Zinc scrap.....	4.75 to 5.00

Buffalo.

BUFFALO, N. Y., March 1, 1910.

Pig Iron.—From 50,000 to 60,000 tons of foundry grades is now under negotiation or already secured by a few large interests. Purchasing has not been resumed to any large extent by the general foundry interests, however, the timorous feeling existing recently not having entirely disappeared, although there are evidences of increased activity all along the line among the foundries in the Buffalo district. Prices current for shipment during the first half per gross ton, f.o.b. Buffalo, are as follows:

No. 1 X foundry.....	\$17.50 to \$18.00
No. 2 X Foundry.....	17.25 to 17.75
No. 3 plain.....	17.00 to 17.25
No. 3 foundry.....	16.75 to 17.00
Gray forge.....	16.50 to 16.75
Malleable.....	17.50 to 18.00
Bessemer.....	19.50 to 19.75
Basic.....	18.00 to 18.50
Charcoal.....	20.50 to 21.00

Finished Iron and Steel.—General conditions are better, an improvement being noticeable not only in sentiment but in actual buying. Specifications are coming in more freely, and considerable new tonnage is being placed both in bars and structural shapes, with a generally good demand for other products. There has been an increase in the inquiry for black and galvanized sheets. The demand for railroad materials is increasing, and a good many inquiries for bridge material are under negotiation by the newly started Lackawanna Bridge Company. The Collingwood Ship Building Company, Collingwood, Ont., has inquiries out for 3000 to 3500 tons of shapes and plates for shipbuilding purposes for prompt delivery, and it is understood that one of the leading interests has quoted 1.33c., Pittsburgh, to offset foreign competition. The Jones & Laughlin Steel Company is definitely in the market with coke tin plates and tin mill products in hot and cold rolled material, the latter for May shipment and the former for June shipment. Local architects will receive bids in about two weeks for the seven-story hotel, to be built by the Akron

Hotel Company, Akron, Ohio, requiring about 500 tons of steel. Contract for the steel work for the Dunn-Salmon Company warehouse, Syracuse, N. Y., about 250 tons, has been let to the Syracuse Bridge Company.

Old Material.—The lifelessness which has characterized the market during the past few weeks continues, with no immediate prospect of increased activity.

The New Andrews & Hitchcock Furnace.—The Andrews & Hitchcock Iron Company, Youngstown, Ohio, on February 19, put in operation its new blast furnace at Hubbard, Ohio. It has been erected on the site of the old No. 1 stack, the new stack having been raised 14 ft. above the old furnace level. The size of the furnace is 19 x 80 ft., and it is equipped with a Kennedy automatic top with skip, operated by an Otis engine and all necessary modern apparatus for successful furnace practice. A new casting house, 65 x 200 ft., has also been erected, equipped with a Brown Hoisting Machine Company's pig breaker and crane. A new William Tod Company's low pressure long cross head blowing engine, 96 x 96 x 60 in., has been installed to supplement the five Tod engines already in use. The new furnace was designed and built by Julian Kennedy, consulting engineer, Pittsburgh, Pa., with Arthur E. L. Dette, engineer in charge of construction. The William B. Pollock Company, Youngstown, Ohio, furnished the iron work and the Stowe-Fuller Company, Cleveland, Ohio, all the fire brick. Niles brick were used for the furnace lining, National brick for the stoves and Empire brick for the pipes and connections. The furnace is now running on foundry iron, and is expected to make about 300 tons per day.

Concrete Dredging Barges on the Panama Canal.—Work will be begun shortly on the construction of three concrete barges to be used with the dredging pumps for the hydraulic excavating and pumping plant of the Pacific division of the Panama Canal. This will be the first time that the construction of the concrete barge has been attempted in American engineering, although successfully used in Italy for some time. Each of the Pacific division barges will be 64 ft. long and 25 ft. wide, and will have a depth of 5 ft. 8 in. The interior beams and columns will have a space of 10 ft. longitudinally and 8 ft. transversely. Wooden forms will be used in the construction of the boats. Two interior longitudinal walls will extend throughout each boat, with a bulkhead at each end forming an interior compartment 40 ft. long by 8 ft. wide. The maximum draft of the barges when loaded will be about three ft. A dredging pump, motor and equipment weighing approximately 60,000 lbs. will be located near the middle of each barge.

During the recent excessively cold weather in Pittsburgh, when many of the mills had their natural gas shut off, the Carbon Steel Company continued to run its open hearth furnaces, having previously equipped them with an oil burning system consisting of tanks, pumping appliances and water cooled burners, remaining permanently in the ports and ready to burn oil on 10 minutes' notice. This apparatus is designed and manufactured by Tate, Jones & Co., Inc., Pittsburgh, Pa.

The Banner Machine Company, Columbiana, Ohio, recently incorporated, has secured several acres of land, with buildings thereon, among which is one of tile and wood construction, 40 x 75 ft., two stories, which has been fitted with a gas engine and machine tools for the manufacture of vacuum cleaners, of the hand and motor driven type. The company manufactures its aluminum castings in the basement and otherwise builds its machines complete. The first lot is now being turned out.

S. DIESCHER & SONS.
Mechanical and Civil Engineers.
PITTSBURGH.

Judicial Decisions of Interest to Manufacturers.

ABSTRACTED BY A. L. H. STREET.

Authority of Agent.—Ratification of Acts.—A seller's agent delegated to settle with the buyer on terms arranged between the buyer and the seller's general agent, and to obtain more satisfactory security for the final payment of the debt, had authority to allow reasonable credits and deductions claimed by the buyer, in order to obtain security which made the debt good. A seller, having accepted and retained notes and a mortgage received by its agent as the proceeds of a settlement with the buyer, and having collected and retained the same, ratified the settlement, and could not thereafter repudiate the allowance of certain credits therein. (Iowa Supreme Court, Zelenka vs. Port Huron Machinery Company, 123 Northwestern Reporter, 332.)

Measure of Damage for Broken Warranty Respecting Machinery.—The general rule is that damages which may be recovered for a manufacturer's breach of warranty of machinery sold for a known purpose are not restricted to the difference between the value of the machinery as warranted and its actual value, but include such consequential damages as are the direct and probable result of the breach, including the reasonable expense caused by the defect. (Arkansas Supreme Court, W. T. Adams Machinery Company vs. Castleberry, 122 Southwestern Reporter 998.)

Measure of Damage for Failure to Deliver Machinery in Contract Time.—One who contracts to manufacture and deliver machinery within a specified time is liable to the buyer for loss of profits arising from failure to deliver within that time, where such loss was within the contemplation of the parties at the time of the making of the contract. The buyer can also recover the amount representing increased cost in installing the machinery. (Texas Court of Civil Appeals, Reagan Round Bale Company vs. Dickson Car Wheel Company, 121 Southwestern Reporter, 526.)

Sales of Manufactured Articles—Claims on Account of Defects.—Where the seller of a manufactured article notifies the buyer that, to obtain credit for defective appliances, he must apply to the manufacturer, a shipment of the article to the manufacturer by the buyer, with notice of claim, is a proper assertion of the claim and demand for credit. (Minnesota Supreme Court, Excelsior Supply Company vs. Charles A. Stickney Company, 122 Northwestern Reporter, 870.)

Right to Recover on Note Given for Machinery Delayed in Delivery.—Where machinery was accepted by the purchasers without objection on account of a two months' delay in shipment and part of the purchase money was paid and notes given for the balance, and afterward another part of the price was paid and renewal notes given, the mere fact that the machinery was not shipped in contract time does not defeat a recovery on the renewal notes. (Florida Supreme Court, Division B, Hyer vs. York Mfg. Company, 50 Southern Reporter, 485.)

Liability for Injury to Minor Employee.—An employee 14 years old and possessing average intelligence, who knew that, if he allowed his foot to extend beyond the guard of an elevator while riding in it, his foot would be caught between the elevator and the floor, and who appreciated the danger, assumed the risk arising from his extending his foot a short distance beyond the guard, and the excuse that he "did not think" did not relieve him from responsibility. (New Hampshire Supreme Court, Cronin vs. Columbian Mfg. Company, 74 Atlantic Reporter, 180.)

Floor Sagging Throws Machinery Out of Alignment.—If an employee was injured by a mill owner's negligence in permitting the floor to sag, so as to throw the machinery out of alignment and cause a grease cup to fall upon him, he could recover for such injuries, both at common law and under the Massachusetts Statute which makes an employer liable for injuries caused by defects in the ways, works and machinery. (Massachusetts Supreme Judicial Court, Howard vs. Fall River Iron Works Company, 80 Northeastern Reporter, 615.)

Injury from Starting of a Shaft.—An employee was injured by the starting of a shaft. The appliances used to set the shaft in motion were in perfect order. He stopped the shaft by the appliances, and the foreman assured him that he would see that no one started it. A rule of the employer forbade employees to set in motion any machinery without assuring themselves that there were no persons about it. Held, that the employer was not liable at common law for the negligence of the foreman in not seeing that no one set the shaft in motion, as the employer was not bound to protect the employee from the danger that another would start the shaft without authority and in violation of a rule. (New York Supreme Court, Appellate Division, Fourth Department, Kirkover vs. Lackawanna Steel Company, 119 New York Supplement, 537.)

Injury to Foundry Employee.—Plaintiff, after having been employed for over six months in a foundry, was injured while helping to push a car upon which was loaded three

heavy flasks containing molds. It was customary to call upon employees indiscriminately to help push the car when loaded. Plaintiff on several occasions had helped push the car, and his ordinary work was only 70 to 100 ft. away. The undisputed evidence showed that the car was properly loaded; that the employees were warned not to place their hands in the open places between the molds because of the danger of being injured and of injuring the molds, and that the light was sufficient. Held that, it not being shown that plaintiff was lacking in common understanding or ordinary intelligence, defendant was not negligent, though no warning was given on this occasion to the plaintiff not to put his hands between the molds. (Washington Supreme Court, Vianello vs. Washington Iron Works Company, 104 Pacific Reporter, 784.)

Safe Scaffold.—Ties laid on the deck of a bridge in process of construction for the purpose of accommodating a traveling derrick, and also used by a signalman as a place to stand while assisting in shifting the rails, are not "scaffolding," within the provision of the New York labor law, which requires an employer to furnish a safe scaffold and to keep it safe. (New York Supreme Court, Appellate Division, First Department, Brady vs. Pennsylvania Steel Company, 119 New York Supplement, 75.)

Machinery Required to Be Guarded.—The New York law requires all vats, pans, saws, planers, cogs, gearing, belting, shafting, set screws and "machinery of every description" to be properly guarded. Held, that other mechanical appliances constituting similar hazards were included in the words "machinery of every description," but that they did not include a railroad track some 3 ft. above the floor of a gallery in a machine shop, on which trucks were operated; there being no inherent danger in the track, nor reasonable ground to believe that an employee in falling would be injured by putting his hand in front of the wheel of a truck which was being operated on the track. (New York Court of Appeals, Wynkoop vs. Ludlow Valve Mfg. Company, 89 Northeastern Reporter, 827.)

Production of Pig Iron in Canada in 1909.

The American Iron and Steel Association has received from the manufacturers statistics showing that the production of pig iron in Canada in 1909 was 677,090 gross tons, against 563,672 tons in 1908, an increase of 113,418 tons, or over 20.1 per cent. The production in 1907 was 581,146 tons, the largest output prior to 1909. In the first half of 1909 production amounted to 349,641 tons and in the second half to 327,449 tons, a decrease of 22,192 tons. Of the total production in 1909 660,856 tons was made with coke and 16,234 tons with charcoal and electricity.

The production of basic pig iron was 357,965 tons, against 335,410 tons in 1908, and the production of Bessemer pig iron was 169,545 tons, against 112,811 tons in 1908. Basic pig iron was made in 1909 by four companies owning nine coke furnaces and Bessemer pig iron by two companies owning three coke furnaces. The basic and Bessemer pig iron was all made with coke. The Canadian furnaces consumed 1,311,796 tons of iron ore and 58,731 tons of mill cinder, scale, &c., last year in the manufacture of pig iron. In addition they consumed 470,080 tons of limestone for fluxing purposes.

On December 31, 1909, Canada had 16 completed furnaces of which 11 were in blast and five were idle. Of the total 12 usually use coke for fuel and four use charcoal. In addition three coke furnaces were being built on December 31.

The Oliver Iron Mining Company, Duluth, Minn., now using upward of 150 steam shovels, has placed its order for this class of equipment for the coming season with the Atlantic Equipment Company, 30 Church street, New York, for the Class 80-18-3 Atlantic shovel. The conditions under which steam shovels are operated in stripping the overburden from the Mesaba range ore deposits, are, perhaps, more severe than in any other service in which shovels are used. This year's order for shovels was placed with the Atlantic Equipment Company after a season's test of one of the new design Class 80-18-3 Atlantic shovels in the Mountain Iron and Burt-Pool mines during 1908-1909.

Trade Publications.

Electrical Apparatus.—General Electric Company, Schenectady, N. Y. Three bulletins. No. 4689 is devoted to ornamental street lighting and illustrates installations of tungsten lamps in several cities. The G. E. Mazda lamp is specially referred to as the latest development in high efficiency metallic filament incandescent lights. No. 4714 describes a volt ammeter for testing automatic railroad signals. No. 4715, which supersedes No. 4692, describes the G. E. 210 railroad motor, which operates at 600 volts and has a capacity of 70 hp.

Measuring Instruments.—J. T. Slocomb Company, Providence, R. I. Pamphlet entitled "The Measuring Book." Treats of use of different types of measuring instruments and contains suggestions in regard to accurate and economical measuring in machine construction. The different instruments used for this purpose, such as the common rule, inside and outside calipers, micrometers, micrometer gauges, reference disks and measuring machines, are illustrated and described; considerable space being given to the construction and use of the Slocomb micrometer.

Coal and Ore Handling Machinery.—Webster Mfg. Company, 2410 West Fifteenth street, Chicago, Ill. Catalogue No. 32. Relates to elevating and conveying systems for handling coal, ore, rock, gravel and other similar heavy material, rapidly, efficiently and economically. The illustrations show the different parts of these systems and also a number of actual installations of machinery for handling coal and ashes in power plants and ore and coal at mines, and mechanical coaling stations for railroads. *The Iron Age*, September 10, 1908, contained an illustrated description of the coal handling equipment installed by this company in the Delaware avenue power house of the Philadelphia Rapid Transit Company.

Pulverizing Machinery.—American Pulverizer Company, Suite 410 Jaccard Building, St. Louis, Mo. Mailing card. Deals with the American ringhammer pulverizer, which is made in two different styles for crushing rock and shale. The former is made in six sizes and is designed to pulverize limestone, quartz, granite, brickbats, phosphate rock, Portland cement clinker and other refractory materials in quantities ranging from 2 to 40 tons per hour. Shale, fireclay, coal, ochres, bone, oyster shells, oil cake, glue stock, slag, sugar, mineral paints and other resistible materials are ground to a fine powder by the shale pulverizer at the rate of from 15 to 120 tons per hour. All the grinding parts are made of manganese steel and consist of rings and hammers arranged spirally around the shaft to form a coil. The rings are the main factor and are used exclusively in the rock pulverizer, while in the other model they do the heavy work of striking, rolling and crushing and are followed by the hammers, which dig up and redistribute the material for a second exposure to the action of the rings.

Wire Rope and Cables.—A. Leschen & Sons Rope Company, 920 North First street, St. Louis, Mo. Folder. Concerned with locked coil cable and locked wire rope for aerial wire rope tramways and cableways respectively. The construction is a series of layers or coils with a surface layer of interlocking sections. Consequently, it is stated, that the rope body is of a very compact character and presents great resistance to the crushing tendency of the load. The interlocking outside layer gives a smooth surface that, it is claimed, eliminates all vibration. Another advantage is that the chance of wires breaking is very small.

Corliss Engines.—Wisconsin Engine Company, Corliss, Wis. Bulletin C-4. Refers to a line of Corliss engines designed for either belt or direct connection. The different models and their parts are illustrated and described, and there are a number of views of engines in course of construction.

Scales.—The Standard Scale & Supply Company, 243 Water street, Pittsburgh, Pa. Leaflet devoted to the installation of a suspension type of scale equipped with an electric automatic recording device by the United States Government at New York to record the weights of the cargoes of imported sugar unloaded on the docks of that port.

Machine Tools.—Hill, Clarke & Co., 125 North Canal street, Chicago, Ill. Circulars, size $8\frac{1}{2} \times 11$ in. Lists tools manufactured by the Western Machine Tool Works, Holland, Mich., and the Chicago Machine Tool Company, Chicago, Ill., which are sold by this company. These include two sizes of radial drills built by the former and five styles of the Chicago hand miller with power feed and either with or without column, produced by the latter. The radial drill and one of the millers were described in *The Iron Age* June 3 and July 20, 1908, respectively.

Lathes.—New Haven Mfg. Company, New Haven, Conn. Catalogue; size 6×9 in.; 58 pages. Pertains to a line of engine lathes ranging from 18 to 65 in. swing and 8 to 36 ft. bed. The illustrations include a number of attachments and details and different sizes of lathes. *The Iron Age* January 30, 1908, contained an illustrated description of the line of lathes, which has been completely redesigned since 1905 to meet the demand for heavier and more powerful machinery to use high speed steel tools.

Metal Shapers and Planers.—Rockford Machine Tool Company, Rockford, Ill. Catalogue. Illustrations and descriptive matter explain the operation of a line of single and back-gearied crank shapers and a 16-in. shaper with single-pulley drive, which was illustrated and described in *The Iron Age* July 30, 1908. Four sizes of single speed planers, the largest of which was the subject of an illustrated article printed in these columns August 19, 1909, and a variable speed planer having four cutting speeds and a constant speed return, complete the list of machines shown.

Boiler Feed Regulator.—Northern Equipment Company, 408 West Indiana street, Chicago, Ill. Booklet; size 6×9 in.; 48 pages. Describes and illustrates the Copes boiler feed regulator and pump governor and gives much valuable information on the question of automatic boiler feeding as compared with the hand method. The economies which result from making the rate at which the feed water is supplied proportional to the rate of evaporation are discussed and charts showing how the regulator keeps the water level the same are included. A number of plants where these regulators have been installed are illustrated, as well as the device and several parts entering into its construction.

Gasoline and Oil Storage Outfits.—The American Oil Pump & Tank Company, Dayton, Ohio. Catalogue. Calls attention to a line of outfits for the storage of volatile and highly explosive liquids. The tanks furnished as a part of this outfit are heavy weight iron which is practically rust and corrosion proof; the pump is of the single cylinder double acting model, and all the valves are accessible. The different methods of installing these outfits are shown, together with views of the several parts.

No Change in the British Method of Grading Pig Iron.

The proposal brought forward by American and German members at the Copenhagen Congress of the International Association for Testing Materials in September, 1909, for the more general adoption of analysis as the basis of pig iron sales, was considered by various representatives of the British iron trade at a meeting held in London, February 10. *The Iron and Coal Trades Review* reports at length the discussion which was participated in by representatives of the Iron and Steel Institute, Cleveland Iron Masters' Association, British Foundrymen's Association, Staffordshire Iron and Steel Institute, British Iron Trade Association, Engineering Standards Committee and members of the International Association for Testing Materials. J. E. Stead, representing the Iron and Steel Institute, argued that the conditions in the British pig iron trade were very different from those existing in the United States and Germany. If analysis were substituted for fracture, he said, it would be necessary to analyze almost every pig bed. Some use is now being made of analysis, particularly where special consignments of pig iron are made to Germany and the United States. British manufacturers, he said, had no objection to working to a specification providing special arrangements are made and the price fixed to cover the extra cost.

Nearly every speaker coincided with Mr. Stead's view that the time had not arrived for changing from a fracture basis to an analysis basis. The sentiment of the meeting was expressed in a resolution, unanimously adopted, declaring "that the conditions governing the sale of pig iron in Great Britain make it undesirable to recommend any immediate change in the existing practice of grading, whether by fracture or analysis." One or two speakers pointed out that fracture is the primary method in use in Great Britain and analysis the secondary method. G. Roberts, representing Woolwich Arsenal, dissented from the view that it is impossible to put iron into storage by analysis, and one of the engineers present said that he had never bought iron in any other way than by analysis. H. Pilkington, representing the British Foundrymen's Association, said that he had carefully considered the pig iron specifications proposed by American associations, but found they had little application in Great Britain, the foundry pig irons of the United States being made from hematite ores which were not used at all for such irons in Great Britain.

The Machinery Trade.

NEW YORK, March 2, 1910.

With the exception of those houses that booked large orders for machinery to fill the lists recently sent out by the Bethlehem Steel Company and a large automobile manufacturing company, business done during the month of February in the machinery trade in the New York territory did not equal the January business. With many houses there was a slight falling off in the amount of orders closed during the last two weeks of the month, although business could by no means be considered poor. In January and during the early part of February there was an enormous demand for equipment from the general manufacturing field and there were but few machinery firms who did not record an unusual number of orders, which came principally for less than a dozen tools at a time. At present, however, inquiries are especially plentiful and the number of entirely new projects coming before the trade gives an encouraging outlook. Manufacturers of automobile accessories and auto parts are getting busy again, and many manufacturers who have been in other lines are changing over at least part of their plants with a view to turning out products for the automobile trade. The lull in the demand during the last two weeks, coupled with the fact that many machinery manufacturers have inquiries for shop facilities, has bettered delivery conditions to a noticeable extent. There are still some sizes of milling machines, planers and lathes on which deliveries cannot be had under from six to eight months, but it appears now that the trade has caught up with itself to some extent and it is not thought that delivery conditions will get any worse unless there is an unprecedented volume of business. Manufacturers of machinery castings have also caught up somewhat and can offer better terms.

The Newark Foundrymen's Association, Newark, N. J., will meet on Wednesday evening, March 9, at Achtel-Stetters dining hall, 844 Broad street, when an address on matters of practical interest to foundrymen will be made by Bradley Stoughton of New York. Mr. Stoughton will talk particularly about the peculiar behavior of gray iron when exposed to superheated steam in pipe lines.

A large amount of machinery will be required later on by the Lake Shore & Michigan Southern Railroad, which is one of the New York Central lines, for locomotive and general car shops to be built at Elkhart, Ind. The railroad company has appropriated \$2,700,000 for improvements at that point, of which \$600,000 will be spent mainly for buildings during the present year. The improvements at Elkhart are to be made because the large Collinswood shops cannot take care of the repair work sent to that point. The plans at present are more or less tentative, but it is understood that the new shops will in a measure duplicate the Collinswood shops. The company has acquired 65 acres of land at Elkhart and it is expected that eventually the Elkhart shops will be the main repair shops of that system. Le Grand Parish, superintendent of motive power of that company, with offices at Cleveland, Ohio, will have charge of the preliminary plans, and the purchasing will probably be done by F. H. Greene, who is the general purchasing agent of the New York Central. It is understood that there are inquiries in the trade at present from the New York Central, although no list is out, but it is not thought that the inquiries are for the Elkhart shops, as those details have not been gone into to any extent as yet.

George Guild, Houston, Texas, is having plans prepared for a machine shop, blacksmith shop and foundry to be built on a site in that city fronting 440 ft. on the Houston ship channel and extending back 1000 ft. The machine shop will be 60 x 250 ft. and will be equipped to handle all classes of heavy machine work. The equipment will include a 15-ton traveling crane to extend the full length of the shop, with smaller cranes at intervals. The blacksmith shop will be equipped with a 1500-lb. hammer, a crane, oil furnace and other blacksmithing equipment. The foundry will also be fitted out for the handling of the heaviest class of work. The plant will be connected with 17 railroads and will have deep water shipping facilities. When equipped the plant will be prepared to handle contracts for the construction of anything in the engineering line.

The Snare & Triest Company, 143 Liberty street, New York, has purchased 15 acres on the Hackensack, N. J., meadows, just east of the Passaic River and about 1000 ft. north of the Plank road. It is the intention of this company to erect during the summer a plant for fabricating structural steel. Plans have not yet been made, but it is understood that the main building will be of concrete, about 120 x 300 ft. In addition there will be buildings for the erection department. The assembling building will have a complete equipment of punches, drills, planers, milling machines, &c., all driven by individual electric motors. It is supposed the plant will employ about 500 men. No machin-

ery lists have been made up as yet, and it will probably be 60 days before the requirements of the company will be definitely known.

A company is being formed to take hold of the Sodus Water Company, Sodus, N. Y. The completed system will require about 4 miles of pipe, 4, 6 and 8 in. sizes, and a 200,000-gal. reservoir with the necessary pumps, &c., to supply it. W. H. Wilcox, Webster, N. Y., is to be president of the company.

The Progressive Mfg. Company, Torrington, Conn., has arranged to take over the plant of the Domestic Sewing Machine Company, Orange and Warren streets, Newark, N. J., and the company will move its gasoline engine and automobile wind shield manufacturing department to the Newark works. C. H. Newton, who is in charge of the company's shops at Torrington, will take up his residence in Newark to manage the manufacturing affairs there. The company will buy some small tools, including a milling machine, planer and boring mill. The machinery now in the Torrington works which can be utilized in the Newark plant will be moved there. The company will employ 125 men when the Newark works are in full operation.

It is apparent that the proposed additions to the New York Subway will be begun before the trade had hoped for, as at a conference held February 28 by the municipal officers and the Public Service Commission it was decided to have the forms of the contracts and specifications for two of the proposed routes ready by April 1, after which advertising for bids for building the routes will be begun at once. It is proposed to build the first extension in Manhattan and another in Brooklyn, which the commission estimates will cost \$100,000,000. Specifications will call for building the two routes in sections and the work will take from four to five years.

R. & J. Dick, Ltd., manufacturers of Balata belts, are finishing their factory at Passaic, N. J., and it is expected to be in operation before summer. The main building is 200 x 300 ft., of brick and concrete construction, with a power plant of about 300 hp. capacity. It is understood that most of the equipment has been purchased, but on account of the large number of orders being received it is probable that the capacity of the plant will be enlarged later on. The main factory of the company is located at Glasgow, Scotland, and orders received now are filled from imported stock. E. H. Griffith is general sales manager, with offices in the Hudson Terminal Building, New York.

The recently incorporated Groff Drill & Machine Tool Company, Camden, N. J., which was organized to take over a going concern, will engage in general machine work and will manufacture a line of tack drills. The officers of the company are Clarence B. Groff, president and general manager; Henry Paul, vice-president; Joseph Taylor, treasurer, and Edwin P. Groff, secretary.

There are inquiries in this market from Ballinger & Perrott, Boyertown Building, Philadelphia, Pa., for some pipe bending equipment, grinders, pipe vises, chain hoists and a general line of shop supplies, such as twist drills and other machinery attachments.

The Tucker Feeder Company, J. V. Leitch, secretary, 1 Madison avenue, New York, intends establishing a plant of its own for manufacturing a patented automatic printing press feeder, and would be glad to receive suggestions as to a location from manufacturing concerns in this section who could give it the required space.

Boilers, engines or steam turbines, heaters, pumps, condensers, dynamos, motors, switchboard and auxiliary apparatus are reported to be among the requirements of the Superior Motor Vehicle Company, Buffalo, N. Y., whose plans for a factory were recently mentioned in *The Iron Age*. A separate power house will be built.

Moore Bros., Barre, Vt., in opening up a new quarry in New York State, will require boilers, Corliss or slide valve engine, air compressor, pneumatic tools and a jaw or gyratory crusher, with power transmitting equipment.

Several alternating current motors, having each a capacity of about 500 hp., will be installed by the Washburn-Crosby Company, Buffalo, N. Y.

An electric plant for city service is to be installed at Wilson, N. Y., the contract having been awarded to the Conant-Bryan Company, Buffalo, N. Y.

The Canfield Brake Company, Corning, N. Y., has installed new machinery and entered upon the manufacture of automobile parts.

The Ray Consolidated Copper Company, through its New York office, has contracted for a large power plant to be built in connection with its new works at Hayden Junction, Ariz. It will consist of four engine driven alternating current generators, having a combined capacity of 7500 kw., with pumps, blowers, compressors, motors, &c., constituting one of the largest orders that has been placed for similar equipment by a mining or smelting company for some time past.

The Brown-Lipe-Chapin Company, Syracuse, N. Y., which is to erect a six-story and basement factory at West Fayette and Seneca streets for the manufacture of differential gears for automobiles, has awarded contract for con-

struction to the Kahn Trussed Concrete Steel Company, Detroit. In addition to the main building there will be separate buildings for molding and tempering and for the power and heating plant, all to be of reinforced concrete.

The Lilly Engine Company, with a capital stock of \$150,000, has been incorporated at Jamestown, N. Y., to manufacture automobiles, motor cycles and motors. G. H. Henderson, Jamestown, and C. H. Henderson and J. R. Graves, Corry, Pa., are the incorporators.

The Thorne Hold-Fast Metal Bar Company, Troy, N. Y., will need for installation in its new factory a complete metal plating outfit, and would be glad to receive full information from manufacturers of such outfits.

James Chalmers' Sons, Williamsville, N. Y., manufacturer of gelatine, will install about \$16,000 worth of new special machinery.

Business Changes.

The Manville Brothers Company, Waterbury, Conn., has purchased from the receivers of the Cross & Spiers Machine Company all the drawings, patterns, &c., of the entire line of machinery heretofore manufactured by the latter company, comprising all kinds of power presses, foot presses, drop presses, edging lathes, burnishing lathes, spinning lathes, buffing lathes, tapping lathes, automatic chain machines, slitters, &c.

Chicago Machinery Market.

CHICAGO, ILL., March 1, 1910.

Railroad business is coming more freely and adds to the general run of trade. The Chicago & Northwestern Railroad has inquired for a list of machine tools which, while not large, is evidence that the machinery manufacturers are to share in the business of rehabilitating Western railroads, and lists from other roads are expected in the near future. Chicago machinery houses have also had an opportunity to do a little business on recent inquiries from the Baltimore & Ohio and the New York Central railroads.

In general the trade shows steady progress and is broadening out in a satisfactory manner. There are many inquiries for second-hand machines, and dealers are doing quite a business in that line.

Following are two important machinery tool lists which have just been issued:

CHICAGO & NORTHWESTERN RAILROAD.

One 100-lb. rubber cushioned helve hammer.
One 20-in. monitor lathe with clearance between top of slide and center of the turret hole not less than $3\frac{1}{2}$ in.
One $1\frac{1}{2}$ -in. forging machine.
One natural die sharpener, complete, with countershaft, wrenches and one No. 6 grinding wheel.
One double emery wheel stand, motor driven, to take 18 in., $1\frac{1}{2}$ in. by $1\frac{1}{2}$ in. on each side.
One No. 6 Ajax forging machine, motor driven, with punching and upsetting devices.
One No. 9 reversing crosshead bulldozer.
One 90-in. driving wheel lathe, extra heavy.
Two power hack saws.
Three power piping, threading and cutting-off machines, single head, equipped with dies, capacity 1 to 4 in.
Four 24-in. stroke power geared crank shapers, with vises.
One milling machine, with index head, center and vise.
One twist drill grinder, with drill pointing device, capacity $7\frac{1}{2}$ in. to 3-in. drill.
One No. 5 hand power slitting shear, to cut $\frac{1}{8}$ -in. metal.
One hand power punch, capacity $1\frac{1}{2}$ -in. hole in $\frac{1}{8}$ -in. plate.
Three steam hammers, 1500 lb. capacity.
Four 18-in. engine lathes, with 6-ft. bed centers, compound rest power, cross head, equipped with a 12-in. independent and universal three-jaw chuck.
One American self-emptying centrifugal oil separator, capacity 520 cu. in.
One lever drill press for drilling small holes with chucks, capacity 1-16 to $\frac{1}{8}$ in.
One two-spindle centering machine.
One bolt heading machine, capacity up to $1\frac{1}{2}$ in., to be equipped with dies in eighths from $\frac{1}{2}$ to $1\frac{1}{2}$ in.
One universal tool grinder No. 3, capacity 12-in. swing, 42-in. centers.
One lathe, 30-in. swing, 16-ft. to bed, equipped with 24-in. independent and universal three-jaw chuck.
One 40-in. upright drill press, with power feed and power gear.
One 51-in. boring mill, with one turret head.
One tool lathe, 15-in. sprocket, 8-ft. bed, with taper and relieving attachment.
One universal cutter and tool grinder No. 2.
One single combined punch and shear, with 48-in. gap, to cut 1-in. plate and punch $1\frac{1}{4}$ -in. holes in $\frac{1}{4}$ -in. boiler steel.
One set of plate bending rolls, belt driven, 12-ft. housings, to bend boiler steel up to $1\frac{1}{2}$ in.
One large turner with extra upper and lower face, with standard.
One large burr with extra upper and lower face, with standard.
One cornice maker's crimper and beader.
One blow horn stake, large end $17\frac{1}{2}$ in. and small end 9 in.
One hollow mandrel stake No. 00.
One high duty lathe, 24-in. swing, 12-in. bed, power cross head, compound rest and equipped with 24-in. independent and universal three-jaw chuck.

POWER & MINING MACHINE COMPANY, CUDAHY, WIS.—GAS ENGINE DEPARTMENT.

One 60-in. engine lathe, 25-ft. bed.
One 36-in. engine lathe, 16-ft. bed.
One 24-in. engine lathe, 24-ft. bed.
One 24-in. engine lathe, 12-ft. bed.
Two 20-in. engine lathes, 10-ft. bed.
Two 14-in. engine lathes, 8-ft. bed.
Two 10-in. speed lathes, 6-ft. bed.
One 32-in. turret lathe, gap.
Two 28-in. turret lathes, gap.
Two 20-in. turret lathes, gap.
Two 14-in. turret lathes, gap.
One 2 x 24 in. turret lathe.
One 3 x 36 in. turret lathe.
One $8\frac{1}{2}$ x 16 in. automatic chucking machine.
One duplex milling machine, extra heavy.
One 48-in. horizontal heavy milling machine with vertical head.
One No. 4 milling machine.
One No. 2 milling machine.
One hand milling machine.
One 84-in. planer with 20-ft. table.
One 48-in. planer with 12-ft. table.
Two 16-in. shapers.
One 96-in. boring mill.
One 72-in. boring mill.
One 48-in. boring mill.
One No. 2 boring mill.
One horizontal boring mill with 4-in. bar.
One double-end drill.
One 6-ft. half universal radial drill.
One 5-ft. half universal radial drill.
One 36-in. upright drill.
One 24-in. upright drill.
Three 20-in. upright drills.
One 20-in. four-spindle gang drill.
One heavy four-spindle rail drill.
One 12-spindle multiple drill.
One medium sized keyseater.
One large keyseater.
One 6-in. cold saw.
One $3\frac{1}{2}$ -in. cutting-off machine.
One centering machine.
One No. 7 bulldozer.
One 30-in. ring surface grinder.
One 16-in. plain cylindrical grinder.
One 20-in. disk grinder.
One 20-in. double disk grinder.
Two heavy grinding stands.
Three polishing stands.
One polishing lathe.
Four tool grinding stands.
One 72-in. gear cutter.
One geared punch press.
One 5 x 10 in. automatic chucking machine.
One No. 4 automatic screw machine.
One $2\frac{1}{4}$ -in. automatic screw machine.
One $\frac{1}{2}$ -in. screw machine, automatic.
One Fox lathe, 18-in. swing.
One 2500-lb. steam hammer.

Gade Bros. Mfg. Company, Iowa Falls, Iowa, whose machine shop was destroyed by fire recently, will rebuild at once. Foundations had been completed last fall for a new concrete shop building, 50 x 300 ft., and this building was to have been erected the coming summer. The plans will be hastened and this building will be erected at once. The company saved several other buildings of its plant, in which machinery is being installed temporarily. The company is in the market for a full line of machine tools for the manufacture of gasoline engines, including lathes, drills, milling machines, grinders, &c., as well as small tools and supplies.

The Continental Bolt & Iron Works, Chicago, will build a new plant at Forty-third street, between Oakley avenue and the Panhandle tracks, having outgrown its plant at Twenty-second and Union streets. The new plant will be of brick and steel construction, with concrete foundations. The plant will be equipped with the most modern facilities for making all articles connected with a general bolt and nut business, and the company will be in the market for equipment in the near future.

The W. K. Palmer Company, Kansas City, Mo., will be consulting engineers for new water works for the city of Beatrice, Neb.

The Baltimore & Ohio Southwestern Railroad Company has under consideration an addition to its shops at Washington, Ind., to cost between \$50,000 and \$60,000, but the plans have not yet been approved by the executives of that road.

The Kansas City, Mexico & Orient Railroad Company has awarded a contract to Westinghouse, Church & Kerr of New York for the erection of shops at Wichita, Kan., which will cost about \$400,000, and will employ about 200 men. Ground for the erection of the new shops will be broken about the middle of March. The building to be erected will consist of erecting shop, car shop, planing mill, power house, storehouse, roundhouse, with necessary accessories.

The Hamilton-Beach Mfg. Company, Racine, Wis., recently incorporated with a capital stock of \$25,000 has leased factory space, which it is equipping with new machinery of the latest type, consisting principally of lathes, screw machines, punch presses and drill presses.

The Thomas B. Jeffery Company, Kenosha, Wis., announces that it is its intention to make several large additions to its factory during the coming season.

Motor driven machinery for a plant manufacturing stove pipe, ventilators, &c., will be required by the Brodin Mfg. Company for a new factory, to be erected in Chicago.

Equipment for the pumping plant and water works sys-

tem decided upon at Oakland, Ill., will probably be purchased this spring.

The new factory of the Marion Shoe Company, Marion, Ohio, recently mentioned in *The Iron Age*, will need extensive power equipment, including a boiler of 125 to 150 hp., Corliss or automatic engine, 75-kw. dynamo and motors.

The Kokomo Stone Company, Kokomo, Ind., has decided upon the purchase of a 6-in. centrifugal pump.

Bids will be taken in about a month for machinery with which to equip the pumping plant planned for construction this spring at California, Mo., by the municipal authorities of that place.

The machinery of the Burlington Gas Light Company, Burlington, Iowa, which suffered from a recent explosion, will be replaced, according to an unconfirmed report from that city.

S. G. Hunter, Atlantic, Iowa, has let contract for the erection of an addition, 50 x 90 ft., to the Atlantic Iron Works, which he controls.

It is reported from Waterloo, Iowa, that the local advancement association has secured funds for erecting a factory there, which is to be occupied by a gasoline engine manufacturing company now located at New Hampton, Iowa.

The Enterprise Foundry & Fence Company, Indianapolis, whose plans for building were recently mentioned, has made all arrangements for the construction of its new plant, including acquisition of a large site.

Additional electric generating units of 2000 kw. capacity will be installed this year by the Aurora, Elgin & Chicago Railway Company, Elgin, Ill., which has decided upon plans for the enlargement of its power station at Batavia, Ill.

An engine and dynamo of moderate capacity will probably be installed in the near future in the plant of the Crawford Sash & Door Company, Chicago.

Contract for the horizontal pumping engine of 6,000,000 gal. daily capacity required by the city of Quincy, Ill., as mentioned some weeks ago in *The Iron Age*, has been secured by the Platt Iron Works, Dayton, Ohio. A machine of the crank and flywheel type, to operate condensing at high duty, will be furnished.

Two new tubular boilers of about 200 hp. will be installed before fall in the municipal power station at Hobart, Ind., if the present plans of the authorities are finally adopted.

Plans for a large factory addition, to be equipped with modern machinery, are being prepared for the account of the Portable Elevator Mfg. Company, Bloomington, Ill. The details have not yet, however, been fully decided upon.

A complete power plant is to be provided shortly for the Hubbard Steel Foundry Company, East Chicago.

The Mais Motor Truck Company will build a plant at Peru, Ind., for the manufacture of auto vehicles for industrial service.

The matter of equipment for its hydroelectric plant near Kankakee, Ill., is expected to be taken up this spring by the Illinois Light & Power Company.

The Tippecanoe Hydro-Electric Power Company, Monticello, Ind., is planning to install another generating unit.

A large installation of boilers will be required at Anderson, Ind., if present plans for a municipal heating plant are carried out.

Motor driven machine tools and other equipment, operating on current purchased from the local central station, will be needed for the new shops of the C. W. Raymond Company, Dayton, Ohio, which include a foundry, 100 x 125 ft., and finishing department, 100 x 320 ft.

The Chicago Drop Forge & Foundry Company, Chicago, is erecting an addition to its plant, 100 x 120 ft., of steel construction, in which will be installed five steam hammers ranging from 2500 to 7000 lb.

The Toledo, St. Louis & Western Railroad will spend \$200,000 for a new roundhouse, machine and car shops at Frankfort, Ind., in which considerable new machinery will be installed.

Bids will be received March 5 for the plumbing, heating, lighting, steam mains, tunnel and sewerage for Science Hall, Indiana University, Bloomington, Ind. John W. Cravens is secretary.

Bids will be received March 7 by the commissioners of Warrick County, meeting at Boonville, Ind., for 25 steel bridges; Ral F. Cherry, auditor. The commissioners of Hancock County, meeting at Greenfield, Ind., will receive bids March 7 for one iron bridge; C. H. Troy, auditor. The commissioners of Morgan County, meeting at Martinsville, Ind., will receive bids March 8 for four bridges; B. E. Thornburgh, auditor. The commissioners of Fountain County, meeting at Covington, Ind., will receive bids March 8 for three bridges; W. B. Gray, auditor. The commissioners of Clay County, meeting at Brazil, Ind., will receive bids March 8 for two steel bridges and seven concrete bridges; J. L. Burns, auditor.

The Badger Cabinet & Seating Works, Washington, Ind., is in the market for a second-hand 24-in. surfacer.

Philadelphia Machinery Market.

PHILADELPHIA, Pa., March 1, 1910.

The trade has hardly been able to figure up fully the volume of business transacted during the month of February at this early date, but many feel very safe in saying that the volume has been quite satisfactory. In some cases a new record has been set for that month, particularly if the maker or merchant was favored with a good share of the recent orders placed by the Bethlehem Steel Company. Taken alone the week just closed has been comparatively quiet, no very important orders or contracts having been reported closed. Pending business on the part of the railroads does not close up very rapidly, although it is not expected that purchases will be deferred very much longer. No further lists have come from the railroads in this vicinity, although it is understood that some have been prepared, but authorization for purchases is still lacking.

Several fair inquiries for minor extension are reported, but the bulk of the recent demand has been for single tools of various kinds. As a rule purchasers want prompt delivery; both manufacturers and merchants, however, find the possibility of early deliveries becoming gradually less, and in some lines is so far distant as to have an unfavorable effect on sales. The market on the whole, though, has a very favorable appearance, and from present conditions bids fair to develop increased activity during the early spring months. Manufacturers generally report more active conditions; orders have been coming in quite freely and apparently are not confined to any particular class of equipment. Plants are being operated on a greater capacity basis, and in some instances are held back by the inability to obtain satisfactory deliveries on crude materials. The lack of skilled mechanics is still pronounced in several instances.

Unchanged conditions are reported in connection with the export trade. Very little demand for the usual standard type of machine tools is to be noted, although more business in special equipment as well as power transmission specialties has developed.

A little better demand for second-hand machinery, tools and general equipment is reported. This business is largely of a day to day character and will still bear considerable improvement. The demand for second-hand engines and boilers is quiet, although with the opening of spring this branch of the trade is expected to show up better. New equipment of the latter class continues in fair demand.

The demand for machinery castings shows a betterment, increased orders for machine tools being reflected by additional orders for both iron and steel castings. Steel casting plants are working at full capacity and are considerably behind on deliveries. Gray iron plants, however, can still make comparatively good shipments. The general appearance of the foundry trade shows improvement.

The Sanitary Company of America, recently incorporated for \$1,000,000 under the Delaware laws, and which absorbed the Mitchell & Van Meter Company, Linfield and Pottstown, Pa., manufacturer of cast iron soil pipe and brass and iron products for the plumbing supply trade, has acquired a plant at Thirteenth and Cumberland streets, this city, which will be used for brass ground key work, the general equipment for which has already been purchased.

The Energy Elevator Company is operating its plant at full capacity. The demand for elevators is about normal, orders coming in freely from all parts of the country. One for a heavy freight lift has been received from Monterey, Mexico. Two hand power elevators have been exported recently to Finland. Electric power freight elevators are being installed for local customers, while two of the same class are to be furnished Vineland, N. J., concerns. Quite a heavy run for apartment house food lifts has developed, particularly from local concerns.

The Philadelphia Roll & Machine Company is taking estimates for a new one story machine shop, 83 x 116 ft., to be built at Twenty-third street and Washington avenue. The building will be of brick and steel, and the equipment in its present shop will cover the requirements in the way of tools. On completion of the new shop the space now occupied by its present shop will be added to its foundry.

The J. W. Paxson Company has recently closed contracts, through its Moyer tramrail department, for tramrail equipment for the entire plant of the McNab & Harlin Mfg. Company, Paterson, N. J., E. E. Brown & Co., Philadelphia, and for the National Car Wheel Company, Pittsburgh, Pa., as well as the new plant of the latter company at Cleveland, Ohio.

The Mann Edge Tool Company, Lewistown, Pa., states that the damage recently caused by fire to its plant at that location was confined to its finishing and packing departments, in which was contained very little machinery. A contract has already been let for the work of repairing the plant, and they expect to get the factory in full operation in a few weeks.

Alfred Box & Co. have recently received a number of good orders for cranes and hoists of various descriptions, and are extremely busy in all departments of their plant. This company reports orders for a 10-ton three-motor crane

for the American Iron & Steel Mfg. Company, Lebanon, Pa.; a 5-ton hand power crane for the Cornwall Ore Banks Company, Lebanon, Pa.; two electric hoists and one 2-ton one-motor crane for H. W. Butterworth & Sons Company of this city; also four cranes, two 5-ton and two 2-ton capacity, 75-ft. span, for the Midvale Steel Works. Recent deliveries by Box & Co. include one 50-ton and two 20-ton four-motor and one 10-ton three-motor electric traveling cranes for the Seaboard Steel Casting Company, Chester, Pa.; one 30-ton four-motor electric crane for the Penn Steel Casting Company, Chester, Pa., and a 5-ton three-motor crane for the Lebanon Valley Iron Works, Lebanon, Pa.

The T. B. Woods' Sons Company, Chambersburg, Pa., will enlarge its plant by the addition of a foundry and machine shop, 100 x 500 ft.; a pattern shop, 40 x 130 ft.; a two-story shipping and storage house, 60 x 130 ft., and an office building, 60 x 60 ft. Requirements in the way of equipment are not available at this time.

New England Machinery Market.

BOSTON, MASS., March 1, 1910.

The machine tool builders report a slight letting up of orders, but on the whole the change is not great, and orders already in hand will permit of no decrease in production. The dealers have experienced no recession, and the approaching spring trade will still further increase their totals, as well as to affect for the better the bookings of the manufacturers.

The brass industry of the Naugatuck Valley is very prosperous. The mills are running full, with double shifts, and the manufacturers of brass products are practically as busy, though some of them are not operating at an extreme tension. It is reported that customers of the mills are buying more heavily than normal under existing conditions, because of the advantageous market, a proof of this being the ratio of sales to return of scrap material of which the mills are the purchasers. However, the valley is uniformly prosperous. The combined financial statement of the subsidiary companies of the American Brass Company, recently issued, shows that 1909 was a good year. Net earnings were \$1,767,000 as compared to \$1,037,000 in 1908, an increase of over 70 per cent. For permanent improvements \$645,000 was expended in 1909 as compared to \$483,000 in 1908, and \$500,000 was charged off for depreciation as against \$400,000 for the preceding year. The item of "merchandise, raw, wrought and in process," increased from \$4,172,000 to \$4,831,000; accounts and bills received from \$3,340,000 to \$3,997,000; current accounts and bills payable and loans from parent company from \$3,401,000 to \$4,243,000; reserve for contingencies from \$848,000 to \$989,000; and cash from \$1,002,000 to \$1,083,000. These figures do not tell the whole story of the finances of the corporations, but give an idea of the relations of the business as between the dull year and that of returning prosperity. The companies are constantly increasing their capacities by new buildings and equipment, and by a greater concentration of departments and improved methods. The machine builders of Connecticut who serve the brass manufacturers are running full, with plenty of business ahead.

The Hendey Machine Company, Torrington, Conn., manufacturer of engine lathes, milling machines and shapers, will build an addition to its works, 100 x 162 ft., one story, with saw-tooth roof, covering an area which is now a court. The new space will be used for manufacturing, chiefly in extending the facilities of the milling machine department, which is greatly congested owing to the demand for both the universal and Lincoln types. The plant is running to extreme capacity, with full force working overtime. The company is bringing out a new No. 4 universal milling machine of standard capacity for the size.

The Taft-Pierce Company, Woonsocket, R. I., makes strong denial of the report that its plant and business have been acquired by the Buick Automobile Company, Flint, Mich. The Woonsocket shops are doing some work for the Buick people, but this is only a small part of the output. The company is very busy, running overtime with between 600 and 700 men on its payroll, manufacturing machine shop products for other concerns.

The F. F. Cameron Company has been organized at Hinsdale, N. H., to manufacture ball bearings, transmissions and engines. The company states that it is equipping its works with machine tools, including turret lathe, grinding machines and milling machines. Power equipment and shafting are already installed.

The Waterbury Clock Company, Waterbury, Conn., will erect an addition to one of its factory buildings, 43 x 152 ft., five stories.

The Black Rock Machine Company, Bridgeport, Conn., has been organized to take over the business of the Van Auken Motor & Machine Company of that city and will operate the plant, manufacturing twin screw motors and steam specialties. Chauncey Marshall is the president of the new company, Henry Adams, Jr., vice-president, Chauncey Marshall, Jr., secretary, and Albert Ketcham, treasurer.

The C. G. Garrigus Machine Company, Bristol, Conn., manufacturer of special machinery, has voted to increase its capital stock from \$25,000 to \$50,000, the proceeds of the new shares to be devoted to increasing the business, including the erection of a new shop building, which will duplicate the present works.

Additions to general manufacturing plants of New England, as announced, include the following: Horace Purinton Company, Waterville, Me., addition to pie plate factory, 95 x 194 ft., one story; W. G. Staib, Bethel, Conn., factory, 40 x 60 ft., two stories; Samoset Worsted Company, Woonsocket, R. I., mill building, 115 x 158 ft., three stories and basement; Vogeson Medicine Company, Fall River, Mass., factory at Pawtucket, R. I., 35 x 75 ft., two stories; William Clow & Son, Laconia, N. H., addition to finishing department; Shawmut Mfg. Company, Shawmut, Me., pulp mill, to employ 1000 hands, in connection with large development of water power.

The entire stock of the Baush Machine Tool Company, Springfield, Mass., manufacturer of multispindle drills and boring machines, has been purchased by F. H. Page for the National Equipment Company, the holding corporation of the Confectioners' Machinery & Mfg. Company of that city. Announcement is made that the management and product of the Baush Company will remain intact, but the large plant at Brightwood will also be employed in the manufacture of the product of the new owner, which is the largest builder of confectionery machinery in the world. Clarence J. Wetzel will remain as treasurer and general manager of the Baush works, and Frank E. Bocorselski, who has been superintendent, will be in charge of the engineering department, a work which he has been doing in addition to his other labors. W. F. Wadleigh, assistant superintendent of the Confectioners' Company, will be the general superintendent at Brightwood. The ownership of the foundry will be of particular advantage to the new owner. The Confectioners' Company is in need of additional manufacturing facilities and will be compelled to build even now, but the possession of these large works will relieve the congestion and make possible the postponement of building plans. The Baush Machine Tool Company is capitalized for \$150,000, of which \$40,000 is preferred stock. Mr. Page had the opportunity to buy the Appleton and Baush interests in the company and the result was the purchase of the entire business. The National Equipment Company was organized a year ago to develop further the prosperous business of the Confectioners' Company. The business of the Baush Machine Tool Company was established in Holyoke about 20 years ago and, outgrowing its quarters, went to Springfield in 1896 and created the large works which it now occupies. It employs 250 men.

The new engineering laboratory of the Sheffield Scientific School of Yale University will be 85 x 200 ft. and four stories. The work of construction will begin the coming summer.

The Underwood Typewriter Company, Hartford, Conn., which is a large buyer of machine tools, proposes to increase its capital in a large way, to provide for larger working resources and an expansion of the business, included, it is understood, very important enlargements of its manufacturing facilities. The present New Jersey corporation will be eliminated, with its capital stock of \$3,500,000, and a Delaware corporation will be organized with authorized capital of \$14,000,000.

The Baird Machine Company, Oakville, Conn., manufacturer of special machinery, presses and tumbling barrels, has acquired a tract of land about a mile south of the center of Thomaston, Conn., which will be used for factory purposes. The company has no detailed plans for the use of the land, but eventually it will be occupied by shops devoted to the rapidly growing business.

The Swift-Waters Mfg. Company, Kensington, Conn., manufacturer of hardware specialties, has increased its capital stock.

The F. E. Reed Company, Worcester, Mass., has brought out a quick change gear engine lathe in sizes from 16 to 20 in., built from new patterns throughout. The gear box and its auxiliary mechanism gives 60 changes of feed and screw pitch. The company is making a specialty of another new machine, known as the 14-in. extra heavy plain turning lathe, designed for the rapid production of automobile, motor boat, engine and other parts, and having the power and rigidity of a 20-in. machine.

On February 23 fire destroyed the brass novelty manufacturing plant of the T. C. Richards Mfg. Company, Winsted, Conn. The loss is estimated at \$125,000, with reported insurance of \$75,000. This is the second fire the company has had lately. On January 5 it suffered a \$30,000 loss. It is understood that the plant will be rebuilt at once.

Among the cities now having under consideration the matter of installing high pressure fire pumps is New Haven, Conn. An investigation of the methods used in the Manhattan system will be made by the proper officials.

Extensive changes will probably be made this season in the layout of the Perry White Granite Company's plant at

Fitzwilliam, N. H., including the introduction of motor drive. Purchase of motors, compressors and other machinery is now being considered.

Cleveland Machinery Market.

CLEVELAND, OHIO, March 1, 1910.

Business with some of the local machine tool dealers has improved during the week. Others, however, report a light volume of orders. Inquiries show an improvement and every one generally looks for a more active demand during the present month. Taken as a whole, February was a rather unsatisfactory month to the trade. The encouraging condition of the automobile industry is inducing some of the manufacturers to go ahead with plant additions that have been under consideration, and a number of the automobile builders are expected to be in the market shortly for machine tool equipment for delivery during the summer or early fall. One large inquiry came out during the week from an Ohio automobile concern for about 50 tools. This inquiry includes 20 lathes, four milling machines, four shapers, six gear cutters, four grinders and a few single tools.

Some good business is in prospect from large manufacturing plants that are about to put in repair shops. Two inquiries from that source developed during the week, each for several tools and each amounting to about \$10,000. There is an improvement in the demand for small tools for new shops that are springing up in metal working lines and for automobile repair shops in connection with garages. Builders of heavy and special machinery report an improvement in the outlook. Some good orders for ore handling plants were placed by the railroads during the week, and other work of a similar nature is expected to come up before long. The general manufacturing situation continues quite satisfactory and the feeling regarding future conditions appears to be better than during the past two or three weeks.

The D. Connelly Boiler Company, Cleveland, has practically closed a deal for a site for a new plant on Collamer street, Collinwood, and expects to begin the erection within a few weeks of a new plant that will double its present capacity. Shipping facilities will be afforded to the new plant, and others that are expected to be built in this new manufacturing district, by a spur track from the Nickel Plate Railroad. The plans provide for the erection of a boiler shop about 140 x 190 ft., a flanging and blacksmith shop 50 x 120 ft., a pattern shop and power house. The company is in the market for power plant equipment and expects to need shears and punches and other additional shop equipment.

A large contract for machinery equipment in connection with new ore handling plants at Ashtabula, Ohio, has been placed by the Lake Shore Railroad with the Wellman-Seaver-Morgan Company, Cleveland, during the past few days. The contract is for two electric haulage systems for operating railroad freight cars under the two large Hulett ore unloading plants at that point. One of these plants was recently completed for the Pittsburgh & Conneaut Dock Company and the use of locomotives for moving the cars under the unloaders has proved unsatisfactory. The contract for the other handling plant on the opposite side of the river was recently placed with the Wellman-Seaver-Morgan Company by the Lake Shore Railroad. The new haulage systems will provide for the moving of the ore cars by cables in continuous operation. The contract includes haulage machines, cables, drums, sheaves, supports under the tracks, &c., equipment being provided for handling cars on four parallel tracks under each unloader.

The Baltimore & Ohio Railroad Company has placed the contract for a new ore handling plant at Lorain, Ohio, with the Brown Hoisting Machinery Company, Cleveland. The contract calls for three Brown fast plants with 7½-ton buckets and a Brown ore bridge equipped with a 10-ton bucket. Among other contracts taken by the Brown Hoisting Machinery Company quite recently is one for a large revolving cantilever bridge for the Warwick Steel Company and a bridge for the United States Government to be erected at California Point, San Francisco.

The incorporation of the Castle Lamp Company, Toledo, Ohio, a few days ago, with \$300,000 capital stock, means the erection of a large plant in that city for the manufacture of automobile and boat lamps. The formation of this company is virtually a reorganization of the Atwood-Castle Company of Amesbury, Mass., whose plant, it is announced, will be moved to Toledo as soon as new factory buildings can be erected. A site has been secured adjoining the plant of the Overland Automobile Company. J. N. Willys, president of the Overland Company, is interested in the new concern. F. E. Castle of Detroit, Mich., general sales manager of the Atwood-Castle Company, will be at the head of the Castle Lamp Company.

The Leece-Neville Company, Cleveland, has been formed, with a capital stock of \$10,000, to manufacture electrical accessories for automobiles. The company has not yet fully formulated its plans, but it expects to equip a plant within the next few weeks and will be in the market for the re-

quired machinery. The incorporators of the company are B. M. Leece and A. E. Leece of the Electrical Mfg. Company, 1363 West Second street; D. M. Neville, G. O. Willet and W. M. Monroe.

The Cyclone Drill Company, Orville, Ohio, is preparing plans for large extensions to its present plant and will add considerable new machine tool equipment. The company reports that its business increased 90 per cent. during 1909 and that from present indications there will be a large increase this year over last.

At the annual meeting of the Berger Mfg. Company, Canton, Ohio, February 23, the following officers were elected for the ensuing year: E. A. Langenbach, president and general manager; Fred Snyder, first vice-president; Richard Yancey, second vice-president; Charles Krieg, secretary, and Frank Schwertner, treasurer. Charles Krieg was formerly assistant treasurer and was elected secretary to succeed C. A. Irwin, who resigned some time ago and who, it is announced, will build a new six-mill sheet plant in Canton, in partnership with several other parties of that city.

At the annual meeting of the Novelty Iron Company, Canton, Ohio, February 23, W. E. Sherlock retired from the presidency and directorate and was succeeded by Sol Toronski. Mr. Sherlock retains his interest in the company, but will devote his time to other business. D. R. McCallum retired from the vice-presidency, being succeeded by J. W. Steiner. H. E. Sherlock was elected secretary-treasurer.

The Ornamental Iron & Bronze Company, a new Cleveland concern, has established a plant at 10611 Quincy avenue for the manufacture of ornamental iron work. The new plant was placed in operation during the past week. A. J. Hollingshead is president and general manager. The company was recently incorporated with \$15,000 capital stock.

The Valley Power Company, in which Congressman T. T. Ansberry and H. D. Bishop of Defiance, Ohio, and others are interested, is planning the erection of a hydroelectric plant on the Auglaize River, near Defiance. The company has asked for a franchise in Defiance with the view of furnishing power for manufacturing plants.

Plans for the erection of a water works plant in Amherst, Ohio, have taken definite form in the organization of the Amherst Water Works Company, with \$100,000 capital stock. About \$60,000 has been subscribed and the balance will be secured by issuing bonds.

The Moore Heating & Mfg. Company, Akron, Ohio, has been incorporated, with an authorized capital of \$10,000, by T. E. Moore and others.

The A. B. C. Casting Company, Cleveland, has been incorporated, with a capital stock of \$100,000, by Attorney T. L. Johnson and others. Further than stating that a foundry will be erected for the company in this city, the company is not yet ready to announce its plans.

The Mount Vernon Bridge Company, Mount Vernon, Ohio, will rebuild its plant, which was recently destroyed by fire, but it has not yet been decided whether Mount Vernon will be retained as the location.

The Cleveland-Cliffs Iron Company, Cleveland, is constructing a dam 20 ft. high and 140 ft. long on the Au Train River at the head of the falls, about 13 miles from Munising, Mich., for the development of water power which will be utilized to operate the paper mill at Munising. The power plant will be located at the foot of the second falls, about ¼ mile below the dam, to which the water will be conveyed through a steel pipe 5 ft. in diameter, generating several hundred horsepower of electricity. Work on the power plant will be commenced early in the spring.

Cincinnati Machinery Market.

CINCINNATI, OHIO, March 1, 1910.

Collectively speaking, the close of February sees no improvement in the general machinery and machine tool situation, which has been slow the entire month. Some good lists, which it had been hoped would be awarded during the month, are still in abeyance, and with but few exceptions none of the manufacturers can boast of more than a moderate run of business or inquiries. The few exceptions that might be noted are the builders of upright drills, gear cutters, boring mills, shapers and millers. As a somewhat singular coincidence, two of the largest lathe manufacturers in this field report the mails of Monday, the last day of the month, as bringing some excellent inquiries. Taking the entire Cincinnati field of manufacture into consideration, the February sluggishness has affected these manufacturers little; indeed, many of them with books crowded with orders for earlier deliveries than could be made rather welcomed the February slump. Shipments which in many instances could not be made earlier than July or August can be furnished in April or May, because of the February let-up in inquiries and orders. There was no cutting down of time nor help on the part of the shops; rather the demand for skilled mechanics has increased, and forces have been increased as rapidly as this expert help could be secured. Taken all in all, therefore, the beginning of March finds all manufacturers in this field awake, optimistic and alert to possibilities which all are

confident are but slumbering and will develop ere the close of the year's first half.

The city of Fort Wayne, Ind., is building a complete machine shop in which in future the city repairing will be done. Among the items purchased for additions to the municipal lighting plant is a 1500-kw. turbine and generator, an increase of 500 kw. in size over the one first considered. Some additional tools and machinery are to be purchased for the new machine shop.

The Dayton Malleable Iron Company, Dayton, Ohio, will enlarge its plant. It has petitioned the city for the vacation of the first alley east of Conover street from Fourth avenue and for permission to cross Third street with an electric tramway.

The new officers of the National Laundry Machine Company, Dayton, Ohio, are: President and general manager, E. E. Niswonger; vice-president, D. I. Niswonger; secretary and treasurer, C. B. Ozias.

J. D. Rauch, James P. Karr and H. J. Anderson, prominent factors in the business of the American Dredge Works in Logansport, Ind., have started auspiciously in their new location at Fort Wayne, Ind., and are operating under a \$200,000 capital stock in a \$60,000 plant.

A report from Anderson, Ind., states that W. S. Poling and Guy Detrick of the Spring Steel Wire & Fence Company have bought the Stanley automobile factory at Troy, Ohio, and will move the machinery therefrom to Anderson and add automobiles to the product of the Spring Steel Company.

The Hamden Foundry Company has been incorporated at Hamden Junction, Ohio, with \$10,000 capital stock, to manufacture castings for the Peck-Hammond furnace heaters. The incorporators are John F. Ozier, A. K. Matterson, O. Q. Sellers, J. N. Stratton and W. H. Henry.

The Shaw Wire Fence Company has been incorporated at Warsaw, Ohio, by Stephen G. Shaw and others.

Milwaukee Machinery Market.

MILWAUKEE, WIS., March 1, 1910.

While the shops here are as busy as ever and inquiries continue to come in freely, reports received very recently by local manufacturers from their representatives in various parts of the United States and Canada indicate a temporary halt in negotiations for many important contracts. In some lines of industry a vague feeling of uncertainty and unrest, not ascribable to any definite cause, seems to prevail. Collections are also slower than they have been and there appears to be less tendency to take advantage of discounts. On the other hand, preparations for increased production are steadily going forward, and orders already placed are sufficient to tax the aggregate present capacity of Wisconsin shops for some months to come.

The growing importance of Milwaukee and its environs as a center both for the manufacture and distribution of machinery is apparent in a movement originating in widely separated sources to concentrate shop and shipping facilities here. This is due largely to favorable labor conditions, as experienced and carefully compared by concerns operating plants in a number of cities, such as the International Steam Pump Company, Allis-Chalmers Company, Illinois Steel Company, International Harvester Company and the Westinghouse companies, of which the National Brake & Electric Company and Milwaukee Locomotive Mfg. Company are constituent parts. All of these are either bringing more work to the local plants or have made preparations to do so; and, as previously noted, several new shops are being constructed by them at the present time.

In an address just delivered before the Engineering Society of Wisconsin, Isham Randolph, who built the sanitary canal at Chicago and has been engaged by the city of Milwaukee to plan a great system of municipal docks on Jones Island, brought out the fact that the expressed purpose of the Illinois Steel Company for building a number of new mills on a site adjacent to its present works would be seriously interfered with by the harbor project; but his plans provide for giving them an equal area of land in a better location. This statement is of great interest locally as the first intimation received here that the Steel Corporation contemplated additions to its Bay View furnaces and mills. It has been taken as a matter of course that they and the North Chicago works would eventually be abandoned in favor of Gary.

Several large plants for the production of automobile parts and accessories are to be erected in this vicinity during the latter part of the year, and there will be considerable increase in local facilities for the production of iron, steel, brass and aluminum castings to be used in such plants. In relation to these various projects some very interesting announcements may be made within the next few months.

Furthermore, it is reliably stated, although without official confirmation, that the motive power department of the Chicago, Milwaukee & St. Paul Railway, including its Pacific Coast branch, has undertaken to largely increase

the output of cars, locomotives, tenders, tanks, &c., at the West Milwaukee shops, where nearly 6000 men are already employed. Add to these important enterprises the scores of smaller foundry, machine shop and factory extensions previously mentioned of late in this report, and some idea may be obtained of the tremendous industrial growth of eastern Wisconsin. Not only as a field of production but also as a market for the sale of equipment manufactured elsewhere its possibilities are considerably greater than in any former season.

The Valley Iron Works Company, Appleton, Wis., which is making a specialty of tanks and other equipment for mill service, has recently been experiencing a heavy run of business, and by fall its manufacturing facilities will undoubtedly need to be considerably enlarged. No immediate extensions are, however, contemplated at this time.

The C. A. Goodyear Company, Tomah, Wis., will install some additional electrical apparatus, its entire plant being now on the basis of motor drive. This establishment has been gradually developed into one of the best of its kind in Wisconsin, and will be in the market at frequent intervals for various lines of standard equipment.

The contract for a traveling crane and bridge for the new docks of the C. Reiss Coal Company, Sheboygan, Wis., together with auxiliary equipment, has been let to the Mead, Morrison Mfg. Company, Boston, Mass.

The erection of a branch factory in Canada is said to be contemplated by the Gold Medal Camp Furniture Company, Racine, Wis., the owners of which are identified with a number of other important industries there; C. C. Gittings is president. If this is decided upon most of the machinery required will be purchased in this country.

The large new gas holder for the Sheboygan Gas Light Company, Sheboygan, Wis., alluded to in *The Iron Age* some months ago as being needed, will be furnished by the Karr-Murray Mfg. Company, Fort Wayne, Ind., which has just been awarded the contract.

A portable sawing plant for mine timbering and construction work has recently been exhibited by the Oshkosh Logging Tool Company, Oshkosh, Wis. This is a very compact outfit and can be readily transported into places accessible only for pack loads.

The new incineration plant for the city of Milwaukee, which is now nearly completed, was described on Thursday of last week in a paper read by S. A. Greeley before the Engineering Society of Wisconsin at the annual meeting in Milwaukee. Those who have a practical interest in the subject can get in touch with Mr. Greeley through the secretary of the society, W. G. Kirchhoffer, Madison, Wis.

Electric power will probably be used in the new mill to be constructed for the Wausau Paper Mills Company, at Brokaw, Wis., but the details of machinery equipment have not yet been fully determined upon; 150 tons of structural steel, to be purchased March 15, will be needed for the mill itself.

Some new electrical machinery will be required during the year by the Merrill Electric Railroad Company, Merrill, Wis.

The Baxter Mining Company, Benton, Wis., will begin construction shortly of a new power house and concentrating plant at that place. Some of the equipment is understood to have been already contracted for.

The Fluor Bros. Construction Company, Oshkosh, Wis., has decided upon the erection of a new shop and storage building, 80 x 80 ft., for which some new tools may be required.

Contract for the 6,000,000 gal. compound horizontal pumping engine, to be installed by the city of Bloomington, Ill., as mentioned early in January by *The Iron Age*, has been awarded to the Allis-Chalmers Company, and will be executed in the West Allis shops. The order for the Quincy, Ill., engine, which was pending at the same time, went to the Platt Iron Works, Dayton, Ohio.

Recent sales of the large gyratory McCully crushers manufactured in this city include machines with 42-in. openings to the St. Louis Portland Cement Company, St. Louis, Mo.; S. B. Martin Company, Filborn, Mich., and Doolittle-Wilcox Company, Ltd., Dundas, Ont., and breakers with 27-in. openings to Dolese Bros. Company, Chicago, and the Chicago & Northwestern Railway Company for its ballast plant at Cedar Rapids, Iowa.

The McDonough Mfg. Company, Eau Claire, Wis., finds this season among the most profitable in its history, and there is every indication that it will need to provide for further expansion of its plant in order to meet the demand from all parts of the country, particularly the Northwestern and Pacific States.

The new works of the Kleckhefer Box Company, Milwaukee, will be among the most modern of their kind in the world and electrically driven throughout.

The Paine Lumber Company, Oshkosh, Wis., after one of the shortest negotiations on record in this section, is reported to have closed a contract with the Chicago office of the General Electric Company for 250 induction motors, to be used in driving timber sawing and woodworking machinery, including a veneer plant.

The Obenberger Drop Forge Company, Milwaukee, which recently succeeded to the business of the John Obenberger Company, will continue to turn out steel hammered forgings and also produce drop forgings for automobile and similar service. It is probable that during the year a much larger output will be provided for.

The engines for the new plant of the Wisconsin Lumber Company, at Hettig, Ark., will not be furnished by the Filer & Stowell Company, as last week's item implied, but by the Southwark Foundry & Machine Company, Philadelphia, being of the Porter-Allen four-valve automatic type. The local concern has contract for the saw mill machinery only.

The Vilter Mfg. Company, Milwaukee, is putting on the market a new type of Corliss engine, with valve gear which departs from their standard of previous years, and is more like that now used by the Wisconsin Engine Company, although with important features of its own. The sales of engines and refrigerating machinery recently made by this concern have been very satisfactory.

The Appleton Merchants' Association, Appleton, Wis., is considering means for securing the erection of a factory there with which to produce a new four-wheel drive automobile, patented by Wm. Besserich, Clintonville, Wis., a company for the manufacture of which is now being organized. This industry, when located, will require the usual outfit of machinery and tools for a motor car plant.

New power and compressor equipment, together with stone working tools, may be needed by Anderson Bros. & Johnson for a new plant at Wausau, Wis., where they contemplate removing their headquarters from Granite Heights, Wis. No direct confirmation of this is, however, obtainable.

A. A. Fraser, Appleton, Wis., is reported to be in the market for a tubular boiler of 60 to 75 hp., together with other apparatus.

A new Corliss engine, resaw and accessory machinery are said to be needed at the present time by the M. H. Sprague Company, Washburn, Wis.

The new gas engine driven power plant of the A. O. Smith Company, Milwaukee, is nearly ready to be put in operation, and the works recently erected will soon be in full blast. With the large number of orders now in hand the company needs all the facilities that it can provide, as parts for automobiles are being furnished every production center in the country.

A two-story addition, 30 x 80 ft., will be made to the plant of the C. Mattison Machine Works, manufacturer of woodworking lathes and other tools, at Beloit, Wis. Fire-proof construction will be followed and a sprinkler system installed.

Lloyd St. John Smith, for many years connected with the Chicago sales office of Allis-Chalmers Company, has been engaged by the Power & Mining Machinery Company to open Southern headquarters in the Equitable Building, Atlanta, Ga., for the sale of mining and rock crushing machinery.

A suction dredge with large centrifugal sand pump will be built by the Manitowoc, Wis., Dry Dock Company for the Great Lakes Land Company, Chicago. A similar outfit will also be used on the new inner harbor work at Milwaukee, if the project for municipal docks is put through, which now seems to be practically assured.

Pacific Coast Machinery Market.

SAN FRANCISCO, CAL., February 24, 1910.

Some idea of the present condition of the machinery trade on the Pacific Coast may be gained from a statement which has just been issued by H. W. Kerrigan, Commissioner of the California Metal Trades Association, in which it appears that this organization now embraces 115 plants, viz.: 24 iron and steel foundries, 48 machine shops, 18 fabricating plants, 14 boiler shops, 8 ornamental iron plants, 6 shipbuilding yards and shops, 15 patternmaking shops and 12 electrical manufacturing establishments. These, taken in connection with the mills and the metal working plants of Washington and Oregon, form by far the greatest manufacturing industry west of the Missouri River, and, stimulated by the large number of orders now in hand, their purchasing power has become much more important than in any former period. In San Francisco alone the progress made since the fire has been phenomenal, while the activity prevailing in Los Angeles, Oakland, Portland, Tacoma, Seattle and other cities has brought about a degree of prosperity which is very gratifying. To an extent heretofore unprecedented, the Coast is now supplying its own needs in the way of machinery and other apparatus for foundries, shops, factories, power and pumping service; nevertheless, Eastern manufacturers are also finding an ever increasing market for their products. One large concern known to the writer, which a year ago was well content with half to three-quarters million dollars' worth of business annually

from all its Coast agencies, has for the past four months been selling at the rate of over three millions, despite the fact that a number of important orders for machinery, in which it and two or three other Eastern companies had practically a monopoly, were taken by local plants.

Recent reports in *The Iron Age* have made specific mention of the business being done by the principal machinery builders and metal workers generally of the upper and lower Coast cities; and, although the recovery from the late depression has been slower here, owing to the need of almost complete rehabilitation from the ground up, following the experiences of the fire, most San Francisco concerns now report a very satisfactory run of business, among them being the Union Iron Works Company, Geo. E. Dow Pumping Engine Company, Pacific Foundry Company, Murray Bros. Machine Works, Compressed Air Machinery Company, Risdon Iron Works, Pacific Jupiter Steel Company, Joshua Hendy Iron Works, Chas. C. Moore & Co., Pacific Gear & Tool Company, Toulouse & Delorieux Company, Doak Gas Engine Company, Henshaw, Bulkley & Co., Felton Water Wheel Company and Byron Jackson Iron Works.

The Weed Lumber Company, Weed, Cal., will construct a large pumping plant in connection with its mill, the installation of a system of water supply and fire protection having already begun.

Motors for electrical operation will probably be purchased in the near future for the plant of the Johnnie Mining & Milling Company, situated at Johnnie, near Rhyolite, Nev.

The McKain Mfg. Company, Los Angeles, Cal., is adding to its motor equipment.

Geo. E. Fitzgerald, Nevada City, Cal., is reported to be in the market for electric power plant machinery, air compressor and other equipment.

J. Wagy, Los Angeles, is planning the construction of water works at Maricopa, Cal., but they will be operated on the gravity system.

Some electrical apparatus will be required this spring by the Eclipse Development Company, Rhyolite, Nev.

Plans are being made by the Southern California Edison Company, Redlands, Cal., for the construction of an enormous hydroelectric power plant in Santa Ana canyon. The machinery requirements have not yet been determined upon.

The Phoenix Iron Works, Portland, Ore., mention of whose plans was made in *The Iron Age* recently, states it has acquired the necessary site for a large addition to its brass foundry, and that construction work will commence some time before summer.

The Standard Iron & Wire Works, Seattle, Wash., is in the market for a second-hand polishing and buffing machine.

The Robinson-Rogers Supply Company, 412 Mercantile Building, Denver, Colo., is in the market for a 10 to 20 ton alfalfa mill.

Detroit Machinery Market.

DETROIT, MICH., March 3, 1910.

Calls recently made at plants in the principal manufacturing districts of this State reveal the fact that their purchasing capacity is greater at the present time, despite the heavy orders already placed for equipment, than in any previous period. Everywhere and in all lines of industry new shops and extensions are being erected, and only a small part of the operating machinery that will be needed within the coming 12 months has as yet been definitely contracted for. Those who produce automobiles, motor trucks or cater to that class of trade are most active, particularly manufacturers of brass and aluminum parts, but metal working establishments of every description, including builders of power, saw mill, paper mill and special machinery in great variety, as well as shop tools, forge hammers, presses, foundry equipment, &c., are working beyond their normal capacity. Practically all will be compelled by fall, if there is no cessation in the demand, to provide for increasing their facilities.

The Weston-Mott Company, Flint, Mich., is arranging for the installation of additional motors for machine tool drive.

The Detroit Copper & Brass Rolling Mills, Detroit, Mich., will put in service this year a low pressure steam turbine to operate on the exhaust from its engines, which will drive an alternating current generator of about 800 kw. capacity.

New woodworking and power equipment will be installed this season in the plant of the Haney School Seat Company, Grand Rapids, Mich.

An air compressor and pneumatic appliances, together with some electrical equipment, will be needed by the W. Gregory Company, Bay City, Mich.

The Grabowsky Power Wagon Company, Detroit, is having plans prepared for a plant 60 x 290 ft. to be erected in the near future. The equipment of this factory will involve a large list of new tools and power apparatus.

A municipal power and electric lighting plant is to be constructed this year at Sebewaing, Mich., and a contract covering the machinery required will be closed soon.

The Solvay Process Company, Detroit, Mich., is reported to contemplate construction of a mechanical filtration plant in connection with one of its works.

A steam power plant of 750 hp. will be erected by the Hammond, Standish Company, Detroit, in accordance with plans now being drawn. The details of the equipment have not yet been decided upon. A 250-ton refrigerating unit is also to be operated in connection with the system.

The Gray Motor Company, Detroit, is providing for a large season's output of gasoline engines to be used in motor boats.

An addition to the plant of the Michigan Wire Cloth Company, Detroit, will be completed this spring.

An engine of 200 hp., to be connected to line shafting, is required by the Portland Milling Company, Portland, Mich.

The municipal authorities at Sturgis, Mich., have engaged Prof. G. S. Williams of the University of Michigan to prepare plans for increasing the capacity of the city's power plant. Some new machinery is likely to be installed before autumn.

The construction of a pumping station for water supply and fire protection is under consideration at Essexville, Mich.

Southern Machinery Market.

NASHVILLE, TENN., March 1, 1910.

Any one who makes a trip of reasonably careful inspection through the Southern States east of the Mississippi River cannot fail to be impressed with the extent of the industrial revival that has taken place in the past 15 or 18 months, especially as manifested in the building, reopening and extension of foundries, shops and factories. Nor will he be less interested in the character of the new equipment with which they are being supplied, as in most cases it represents standard apparatus of acknowledged excellence. If he departs from the trunk lines or leaves the railroads altogether for the "hinterland," the traveler will also find himself in the midst of development work in iron and coal mining, mineral land exploitation, lumbering, &c., on a scale comparable only to the great boom period; and, returning to the centers of population, he will be struck with the number of electric power and lighting stations, pumping plants for water supply and sewage, and other improvements that are being installed for the benefit of industrial communities. All of these various factors in the upbuilding of a large and now prosperous section are reflected in the items of news affecting the machinery trade, some of which that have current interest follow.

The Maxwell-Knight Iron Company, Butler, Tenn., will provide considerable equipment this season for mining operations in that vicinity, including the installation of pumps, log washers and power machinery.

The South Georgia Iron Works, recently organized at Atlanta, Ga., will establish a machine shop, equipped with modern tools, which, it is stated locally, will be devoted largely to repair work.

An alternating current generator of about 125 kw. will be bought in the near future by the Toccoa Falls Light & Power Company, Toccoa, Ga.

Some electrical apparatus will probably be needed shortly by the Brevard Light & Power Company, recently formed at Brevard, N. C.

A tubular boiler for one of the municipal pumping stations will be purchased within the coming month by the city of Savannah, Ga.

A new pumping unit is about to be purchased for the municipal water works at Cordele, Ga.

A large factory equipped with power and woodworking machinery will be erected at Nashville, Tenn., by the Tennessee Oak Flooring Company.

Installation of pumping apparatus for a system of water works has been decided upon by the municipal authorities at Wrightsville, Ga.

Electric power and operating machinery will probably be needed this season by the Lignite Coal Mining Company, Marlboro, Ky., for operating its underground workings and coal handling plant.

The construction of a pumping station is under consideration at Milton, Fla.

A metal working establishment for general industrial service will be provided at Starkville, Miss., by Rand Bros., who are planning the erection of a machine shop.

Modern machinery will be installed this year in the plants of the Little Lumber Company, Clyde, Miss., which were recently acquired, to displace equipment of older types.

A steam driven electric unit of 125 kw., to furnish direct current on the three-wire system, is to be installed before

autumn by the municipal water and light plant at Paris, Tenn.

The City Council of Morristown, Tenn., has authorized an appropriation of \$10,000 for improvements to the water works system. It is stated that most of the necessary equipment has been bought.

The Gurley Light & Power Works Company, Huntsville, Ala., wishes to purchase a small deep well pump for 100-ft. lift, also a 200-hp. water heater and a steam whistle. Second-hand equipment, if in good condition, will be acceptable.

The Frederick Railroad Company, W. S. Taylor, general manager, Frederick, Md., will construct, in the near future, new terminal barns, shops and a freight house. Details will probably be available within 30 days.

The Dalton Furniture Company, High Point, N. C., has awarded contract for a two-story addition to its plant, which is to be 30 x 50 ft. The company is in the market for an engine from 80 to 90 hp.

Bids will be taken this spring for a hydroelectric plant of considerable capacity to be constructed by the city of Pulaski, Va. Particulars in relation to the machinery required may be obtained by writing to the superintendent of municipal power and lighting, C. E. Harris.

Machinery for the water works will be purchased within the next few months at Portsmouth, Va., in accordance with the plans prepared by the municipal authorities.

Additional equipment for the municipal service system at Roanoke, Ala., including motor operated centrifugal pumps, will probably be contracted for this spring. Installation of a mechanical filtration plant is also being considered. Power will be developed in the near future at a hydroelectric station to be built near the city.

Northwestern Machinery Market.

MINNEAPOLIS, MINN., March 1, 1910.

From being merely the distributing centers of a few years ago, the cities of the Northwest are entering upon the production of castings, machinery and fabricated metals in steadily growing volume. Minneapolis-St. Paul at the eastern end of the chain, with Duluth as a factor to be reckoned with in future, and the Puget Sound ports at the Western railroad termini have naturally become the leaders in the movement; but machine shops and foundries are also springing up in communities all along the line. Not only has there been of late an abundance of business for all of these, but Eastern manufacturers and supply houses find their Northwestern agencies among the most profitable that they have, as shown in the constant enlarging of office quarters, increases in sales force, &c. Machinery for power generation, pumping, mining, milling, timber cutting and woodworking is chiefly in demand, but equipment used in the metal trades, electric and gasoline motors, pneumatic tools and construction apparatus of all kinds can be sold in surprisingly large volume. In the two classes of trade first named, municipalities are the heaviest buyers.

Plans for a water works system at Gregory, S. D., are being matured, and pumping machinery will be provided shortly, the necessary funds having been voted.

The Minnesota Stove Works, Shakopee, Minn., will build an addition, 80 x 150 ft., for which considerable equipment is said to be required.

The Zumbro Power Company, Mazeppa, Minn., whose preliminary plans were referred to in *The Iron Age*, is considering the installation of hydraulic turbines and generators in a modern plant of large capacity.

The Builders' Iron Works Company, St. Paul, has been organized by Oscar L. Johnson and Fred J. Kreuss of that city for the purpose of establishing a fabricating plant.

The construction of a pumping station is under consideration by the municipal officials at Lemmon, S. D.

The Zenith Fuel Saver & Smoke Abater Company, organized at Wilmar, Minn., is planning the erection of a factory, work upon which will begin in the spring.

At Stevensville, Mont., plans are being actively carried forward for the construction of water works.

Extensive improvements, including the installation of new pumping units, will be made in the water works at Bellingham, Wash., as soon as they have been definitely taken over by the city, as recently decided.

Some increase will probably take place before long in the manufacturing facilities of the St. Paul Boiler & Mfg. Company, St. Paul, which has provided more working capital and contemplates improvements in the plant.

New boilers and other apparatus will be added this spring to the power plant of the Evanston Electric Light Company, Evanston, Wyo.

Kilbourn & Clarke, Seattle, Wash., have taken the contract for the new pumping plant at Pasco, Wash.

Some additional machine equipment for repair work will be provided this year by the Puget Sound Electric Railway Company, Wash.

Construction work will begin this spring on the hydroelectric plant of the Skagit County Power Company, which has established headquarters at Anacortes, Wash. This is designed for an ultimate capacity of 100,000 hp. It will be some time, however, before machinery can be installed.

A municipal plant for power and lighting is likely to be built this year at Gettysburg, S. D.

The city officials at Stillwater, Minn., are planning the construction of water works, with a modern high duty pumping engine of the horizontal direct acting type.

The warehouse of J. Gumbinshy, Kalamazoo, Mich., dealer in scrap iron and paper makers' supplies, was recently destroyed by fire, and it is intended to erect a large plant equipped with a hydraulic press, automatic sprinkler system, railroad scales, &c. Power plant equipment will also be required for operating the plant.

The Northern Pacific Railroad Company will require equipment to furnish a new foundry, which will be built at Brainerd, Minn. It is understood that work on this foundry will be commenced shortly.

Pittsburgh Machinery Market.

PITTSBURGH, PA., March 1, 1910.

An era of prosperity, so uniform as to be without many features of prominence, has settled down upon the manufacturers and dealers of the Pittsburgh district; so that, outside of the market quotations printed elsewhere in this issue, it is difficult to tell what will be most interesting to the machinery trade in general. Orders for forge and machine shops, foundries, mills and furnaces follow inquiries with great regularity, and there is a steady influx of the latter. In one respect only has the situation been disappointing—viz., continued lack of buying by the principal railroads of the country. Those who produce or handle railroad material are, however, far from experiencing a dull period, as heavy purchases have recently been made for the account of electric traction lines and privately owned railroads used for special purposes. The large aggregate of orders for the last named is chiefly the outcome of the development operations now being vigorously prosecuted in the mining and timber districts of the country, although much material is also needed in and about industrial works. Nearly all plants recently erected, even more than has been the practice heretofore, are so planned that standard gauge cars can be brought directly into the yards or through the shops for unloading and loading, giving each group of buildings practically a terminal of its own. All of this eventually accrues more largely to the benefit of the Pittsburgh district than to that of manufacturers in any other section, owing to the preponderating share of the trade which it holds.

From Niles, Ohio, it is reported that the business of the Thomas Steel Company of that place has been disposed of to the Bigsby Mfg. Company, Cleveland, Ohio, who will concentrate the manufacturing there.

There will be some extension this spring of the manufacturing facilities of the Irwin Foundry & Mine Car Company, Irwin, Pa., including new building and equipment.

The addition to the plant of the Seagrave Mfg. Company, Columbus, Ohio, has been completed and new equipment installed, giving the concern 16,000 sq. ft. more floor space.

The Hoppenstall Forge & Knife Company, Pittsburgh, Pa., is carrying out plans for a large addition to its plant, in the equipment of which some new apparatus will be needed.

The new municipal water works at Clarksburg, W. Va., will probably include two 150-hp. water tube boilers, three horizontal direct acting pumps of 2,000,000 to 3,000,000 gal. daily capacity, and a mechanical filtration plant.

Machinery will be purchased this spring for a pumping plant to be erected by the city of Edinboro, Pa.

The Owens West Virginia Bottle Company, heretofore alluded to in *The Iron Age*, whose headquarters for the present are at Toledo, Ohio, has decided upon the installation in its new plant of a large line of direct current motors, 40 to 50 machines being needed.

Power and wood working machinery will be required by Geo. Wolverine, Middletown, Ohio, if plans which he now has under way for the erection of a box factory there are carried into effect.

An electric generating plant is to be installed at Hartwick, Pa., by the Hartwick Power Company, recently organizer for furnishing commercial current and lighting to the community.

The Packers Motor Truck Company has been formed at Pittsburgh to put an industrial vehicle on the market. Details of plant equipment have not been given out.

The equipment for the new power plant of the Inland Empire Railway Company, Spokane, Wash., consisting of two 4000-hp. generating units, with the necessary auxiliary apparatus, will be furnished by the Westinghouse Electric & Mfg. Company.

The Coshocton Light & Power Company, Coshocton, Ohio, is preparing to put in service a new steam turbine of

750 hp., driving an alternating current generator, inclosed type, of corresponding capacity, together with other electrical apparatus.

The Sligo Iron & Steel Company, Connellsville, Pa., is preparing to increase the output of its plant and will install additional equipment in the near future. Immediate needs have been arranged for but more apparatus will be required later.

The Central Metal Works, organized in the fall at Harrisburg, Pa., has put in operation a well equipped plant for brass and alloy casting and finishing. All necessary equipment is provided to meet the present demands of the business.

The recent fire at the Tyler Tube & Pipe Company's plant, Washington, Pa., was not serious enough to stop operations. The carpenter shop, which was the only part of the plant burned, will be rebuilt immediately.

The Bessemer & Lake Erie Railroad, controlled by the Carnegie Steel Company, Pittsburgh, announces that it will spend about \$200,000 in improvements and extensions to its shops at Greenville, Pa. The new buildings will include an office for the superintendent of motive power and his staff, a modern 17-stall roundhouse, a forge building 400 ft. long, fireproof pattern shops, an addition to the power plant, a coaling station and several other structures. Two new 500-hp. engines will be installed.

L. H. Focht & Son have been awarded a contract to erect a coal storage plant at Second and Chestnut streets, Pittsburgh, for Charles Miller. There will be a building, 50 x 60 ft., equipped for the handling and storing of coal, and it is estimated that it will cost about \$3000.

Southwestern Machinery Market.

KANSAS CITY, MO., March 1, 1910.

While there is not a great deal of machinery produced in this section, compared with the output of cities farther east, most of the large machinery houses maintain offices in Kansas City and their local representatives have had all they could do lately to prepare estimates on contracts offered for competitive bids. Of greatest interest at this time is undoubtedly the unprecedented activity in the construction of pumping plants throughout the Western and Southwestern States. In purchases made by municipalities several tendencies are apparent. Cities which have shown a rapid increase in population within the past decade are abandoning the smaller direct acting pumps, which heretofore served their purpose, in favor of compound or triple expansion pumping engines which will show high economy in the use of fuel. Smaller communities are, so far as practicable, adopting motor driven centrifugal pumps and arranging their stations on the unit system, so that the consumption of electric power, which is either generated in their own plants or purchased from local lighting companies, will be no more than proportional to the exact demands of the service. Frequently coupled with this system, also, is the use of multi-stage auxiliary pumps, by means of which the pressure in the mains can be quickly boosted to any degree which the mains themselves will stand, thereby extending the limits of effective fire protection and often enabling fire engines to be altogether eliminated. Another tendency notable in the Southwest where natural gas, oil or lignite fuel can be effectively utilized is the installation of internal combustion engines for driving pumps and electric dynamos.

A Corliss engine of 100 to 125 hp. is to be installed by the Berryville Milling Company, Berryville, Ark.

Plans are ready and machinery will soon be purchased for the new pumping plant and water works system at Centralia, Mo.

The Standard Automobile Company, which operates plants at Kansas City and St. Louis, has acquired additional manufacturing facilities at Wabash, Ind.

The municipal authorities at Isabel, Okla., have ordered plans for a pumping plant prepared, as funds to provide water works were recently voted.

Construction of a pumping station and water distribution system is under consideration at McCook, Neb.

The plant of Broghamer & Pitman, Chadron, Neb., will probably be enlarged this season and some new power and pressure machinery added.

An electric power station is to be built midway of its line by the Kansas City, Lawrence & Topeka Railroad Company, the headquarters of which are at Kansas City.

It is reported from Bay City, Texas, that a pumping plant will be constructed there by the municipality.

Plans are being made by the Booneville Light & Water Company, Booneville, Ark., for the construction of a new electric power and pumping station. The details of equipment have not yet been decided upon.

Work will commence at once on a pumping plant for the city of Childress, Texas. The machinery has not yet been ordered.

The Phoenix Railway Company, Phoenix, Ariz., will build new machine shops for repair work and provide suitable equipment to take the place of that recently burned.

A gas engine of about 100 hp., electric dynamo, motors and other apparatus will be purchased shortly by the Brady Water & Light Company, Brady, Texas.

Ore reduction machinery, including a concentrating plant, will be required this year by the Mt. Elliott Consolidated Mines Company, McCabe, Ariz.

The equipment of the Bonham, Texas, water works will be enlarged.

Operating machinery is to be provided at once by the Skull Valley Mining & Milling Company for its workings near Skull Valley Station, Ariz., and a large ore reduction plant is expected to be built later.

The construction of a pumping station is under consideration at Farmington, N. M., where an election has been called to provide the necessary bond issue.

Installation of water works for operation by the municipality is under consideration at League City, Texas.

A tubular boiler of 150 to 200 hp., water tube boiler of 200 hp., motor driven centrifugal pump of small capacity and possibly additional generating machinery will be installed by the Brownwood Gas & Electric Company, Brownwood, Texas.

Government Purchases.

WASHINGTON, D. C., March 1, 1910.

The Isthmian Canal Commission will open bids March 7 for one vertical fire tube boiler, 56 in. by 8 ft. 6 in.

F. W. Altstaetter, Captain United States Engineers, Wheeling, W. Va., will open bids March 9 for building a fireproof power house to contain a 100-hp. gas engine, air compressors, &c.

The Commissioners of the District of Columbia, Washington, opened bids February 23 for one 12 x 12 in. triplex single acting power plunger pump and one 20-hp. Springfield gas engine, as follows: Otto Gas Engine Works, Philadelphia, Pa., \$2193; National Electrical Supply Company, Washington, \$2020.75; Vermilye & Power, New York, \$1245 for pump only; Platt Iron Works, Dayton, Ohio, \$2420; Columbia Pump & Well Company, Washington, \$1995 and \$2095 for double acting plunger.

The Bureau of Supplies and Accounts, Navy Department, Washington, opened bids February 21 for the following:

Class 41. One direct current engine driven generating set—Bidder 55, A. D. Granger Company, New York, \$2592, \$2542, \$2297 and \$2247; 168, Westinghouse Electric & Mfg. Company, Baltimore, Md., \$2386 and \$2150; 174, Fort Wayne Electric Works, Fort Wayne, Ind., \$2125.

Class 71. For furnishing and installing on foundations built by the Government two centrifugal pumps at Las Animas, Colo.—Bidder 6, Alberger Pump Company, New York, \$3125; 38, D'Oliver Engineering Company, Philadelphia, Pa., \$3674; 79, Jeanesville Iron Works Company, Washington, Pa., \$2555 and \$2590.

Class 131. Three air compressor outfits—Bidder 18, Bury Compressor Company, Erie, Pa., \$678, unit; 27, Clayton Air Compressor Works, New York, \$400, unit; 54, General Electric Company, Schenectady, N. Y., \$1205, total; 92, Manning, Maxwell & Moore, New York, \$1311.96 and \$1128.06, totals; 107, National Brake & Electric Company, Milwaukee, Wis., \$885, total; 123, Platt Iron Works, Dayton, Ohio, \$2232; 176, Ingersoll-Rand Company, New York, \$1089.

Class 141. One motor driven engine lathe—Bidder 452, Fairbanks Company, Washington, D. C., \$3060; 78, J. H. Johnson, Philadelphia, Pa., \$3546 and \$3696; 92, Manning, Maxwell & Moore, New York, \$3775, \$3640 and \$3100; 106, Niles-Bement-Pond Company, New York, \$3478 and \$5475.

Class 161. One universal radial drill—Bidder 52, Fairbanks Company, Washington, D. C., \$1745; 92, Manning, Maxwell & Moore, New York, \$1835; 106, Niles-Bement-Pond Company, New York, \$1710; 122, Prentiss Tool & Supply Company, New York, \$2008; 151, Taylor Machinery Company, Boston, Mass., \$1774.

Schedule 2287 of the Bureau of Supplies and Accounts, Navy Department, Washington, calls for two polishing and buffing lathes; schedule 2296, for one grinder, one crushing roll and one screen. Bids will be opened in Washington March 15.

The Taxation of Corporations in New York State.

The New York Board of Trade and Transportation has called a State convention to be held in the rooms of the Chamber of Commerce of Rochester of the city of Rochester, N. Y., beginning March 30 at 10 a.m., for the purpose of considering the advisability of amending the State law for the taxation of manufacturing corporations, so that their taxation upon capital and surplus outside of real estate and special franchises will be uniform throughout the State. This will protect such corporations from inevitable taxation upon their machinery, tools, &c., which is done in other nearby States, greatly to the advantage of the manufacturing corporations located there and further to the advantage of such States by increasing the value and amount of their taxable property, and by the increase and extension of manufacturing within their borders. The convention will be composed of accredited

delegates appointed by mayors of cities, chambers of commerce and associations of merchants and manufacturers in the State.

Labor Notes.

The first serious disturbance since the strike of the machinists of the Bethlehem Steel Company was declared, three weeks ago, came early on the morning of February 25, when a number of strikers from various departments, mostly foreigners, appeared at the gates and forcibly prevented employees from going to work. Soon after orders were issued to close down the entire plant, except the blast furnaces. The State Constabulary was called upon and a detachment has now been on duty at the South Bethlehem works for several days. The rioters were quite active in the latter part of last week, but conditions have been quieter this week, with a resumption of work in some departments.

The expected demand for an advance in wages was made this week by the Iron Molders' Union upon foundries in New York and vicinity. Heretofore the molders have been receiving \$3.25 a day and core makers \$3 a day. Foundries are now asked to pay \$3.50 a day for both molders and coremakers. This rate was recently granted by union foundries in Chicago and Pittsburgh. It is understood that a similar demand has been made upon the machinery foundries of Cleveland.

The annual convention of the Amalgamated Association of Iron and Steel Workers will be held in Fort Wayne, Ind., in May.

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CURRENT METAL PRICES.

The following quotations are for small lots. Wholesale prices, at which large lots only can be bought, are given elsewhere in our weekly market report.

IRON AND STEEL— Bar Iron from store—

Refined Iron:	
1 to 1½ in. round and square.....	\$ 1.90 ^c
1½ to 4 in. x ½ to 1 in.	\$ 2.10 ^c
1½ to 4 in. x ¾ to 5-16.....	\$ 2.10 ^c
Rods—½ and 1½ round and square.....	\$ 2.10 ^c
Angles:	
8 in. x ½ in. and larger.....	2.10 ^c
8 in. x 5-16 in. and 4 in.	2.30 ^c
1½ to 2½ in. x ½ in.	2.30 ^c
1½ to 2½ in. x 3-16 in. and thicker.....	2.30 ^c
1 to 1½ in. x 3-16 in.	2.30 ^c
1 to 1½ in. x ½ in.	2.30 ^c
½ x ½ in.	2.40 ^c
½ x ½ in.	2.50 ^c
½ x ½ in.	3.55 ^c
½ x 3-32 in.	4.35 ^c
Toes:	
1 in.	2.65 ^c
1½ in.	2.45 ^c
1½ to 2½ x 4 in.	2.15 ^c
3 in. and larger.....	2.15 ^c
Beams:	
Channels, 3 in. and larger.....	2.10 ^c
Bands—1½ to 8 x 3-16 to No. 8.....	2.35 ^c
"Burden's Best" Iron, base price.....	3.15 ^c
"Burden's H. & S." Iron, base price.....	3.95 ^c
Norway Bars.....	8.00 ^c

Merchant Steel from Store—

per lb	
Bessemer Machinery.....	.19 ^c
Tee Calk, Tire and Sleigh Shoe.....	2.50@3.00 ^c
Best Cast Steel, base price in small lots.....	

Sheets from Store—

Black	
One Pass, C.R.	R. G.
Soft Steel.	Cleaned.
No. 16.....	lb 2.90 ^c
No. 18 to 21.....	lb 2.95 ^c
No. 22 and 24.....	lb 3.05 ^c
No. 26.....	lb 3.10 ^c
No. 28.....	lb 3.20 ^c

Russia, Planished, &c.	
Genuine Russia, according to assortment,	P. D. 12 @ 14 ^c
Patent Planished, W. Dewees Wood.	P. D. A, 10 ^c ; B, 9 ^c net.

Galvanized.

Nos. 14 to 16.....	P. D. 3.20 ^c
Nos. 22 to 24.....	P. D. 3.55 ^c
No. 26.....	P. D. 3.75 ^c
No. 28.....	P. D. 4.10 ^c
No. 20 and lighter 36 inches wide, 25 ^c higher.	

Genuine Iron Sheets— Galvanized.

Nos. 22 and 24.....	P. D. .575 ^c
No. 26.....	P. D. .625 ^c
No. 28.....	P. D. 7.25 ^c

Corrugated Roofing—

2½ in. corrugated, Painted.....	Galvd.
No. 24.....	lb 3.85
No. 26.....	lb 3.95
No. 28.....	lb 3.75

Tin Plates—

American Charcoal Plates (per box.)

"A.A.A." Charcoal:	
IC, 14 x 20.....	\$.63 ^c
IX, 14 x 20.....	.78 ^c
A Charcoal:	
IC, 14 x 20.....	.85 ^c
IX, 14 x 20.....	.65 ^c

American Coke Plates—Bessemer—

IC, 14 x 20.....	.84 ^c
IX, 14 x 20.....	.50 ^c

American Terne Plates—

IC, 20 x 28 with an 8 lb. coating.....	.88 ^c
IX, 20 x 28 with an 8 lb. coating.....	.10 ^c

Bolts—

Carriage, Machine, &c.—

Common Carriage (cut thread):	
¾ x 6 and smaller.....	.70&12 ^c
Larger and longer.....	.65&15 ^c
Common Carriage (rolled thread):	
¾ x 6, smaller and shorter.....	.70&12 ^c
Phila. Eagle, \$3.00 list.....	.80 ^c
Bolt ends with C. & T. Nuts.....	.65&15 ^c
Machine (Cut Thread):	
¾ x 4 and smaller.....	.70&12 ^c
Larger and longer.....	.65&15 ^c

Nuts

Blank or Tapped:	
Off list.	
Square.....	4.90 ^c
Hexagon.....	.5.30 ^c
Square, C. T. & B.....	.5.30 ^c
Hexagon, C. T. & B.....	.6.10 ^c
Hot Prepped:	
Off list.	
Square.....	5.40 ^c
Hexagon.....	.5.80 ^c

Seamless Brass Tubes—

List November 13, 1908.	Base price 18 ^c
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Brass Tubes, Iron Pipe Sizes—

List November 13, 1908.	Base price 18 ^c
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Copper Tubes—

List November 13, 1908.	Base price 22 ^c
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Brazed Brass Tubes—

List August 1, 1908.	20 ^c P. D.
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High Brass Rods—

List August 1, 1908.	15 ^c P. D.
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Roll and Sheet Brass—

List August 1, 1908.	15 ^c P. D.
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Brass Wire—

List August 1, 1908.	15 ^c P. D.
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Copper Wire—

Base Price.	Carload lots mill 15 ^c
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METALS—

Tin—

Straits Pig.....	P. D. 37@37 ^c
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Copper—

Lake Ingots.....	P. D. 144@145 ^c
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Electrolytic.....

Casting.....	P. D. 144@145 ^c
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Sheet Copper Hot Rolled, 16 oz (quantity lots) P. D. 19 ^c	
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Sheet Copper Cold Rolled, 16 oz advance over Hot Rolled.	
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Sheet Copper Polished 20 in wide and under, 16 oz square foot	
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Sheet Copper Polished over 20 in. wide, 2¢ oz square foot	
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Pianished Copper, 1¢ oz square foot more than Polished	
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Spelter—

Western.....	P. D. 64@64 ^c
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Zinc—

No. 9, base, casks.....	P. D. 84@84 ^c
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Lead—

American Pig.....	P. D. 54@54 ^c
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Bar—

P. D. 64@64 ^c

Solder—

1½ & 3½, guaranteed.....	P. D. 294@294 ^c
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No. 1.....

P. D. 184@184 ^c

Refined.....

P. D. 174@174 ^c

Prices of Solder indicated by private brand vary according to composition.

Antimony—

Dealers' Purchasing Prices Paid in New York	Cents
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Copper, Heavy cut and crucible.....	P. D. 11.75@12.00
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Copper, heavy and wire.....	P. D. 10.25@10.50
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